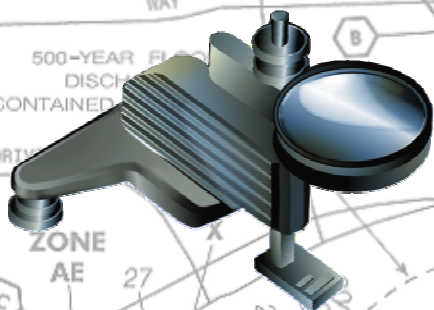
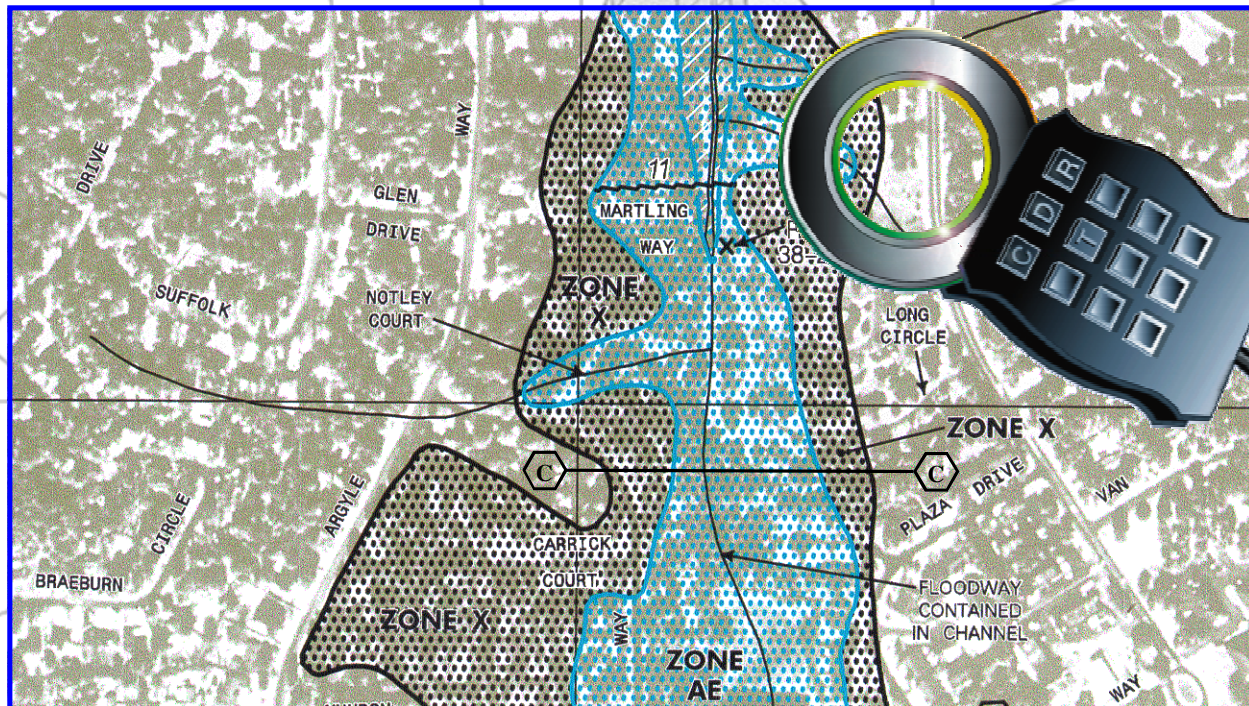


# Modernizing FEMA's Flood Hazard Mapping Program

## A Progress Report

May 2001





### Foreword

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The Federal Emergency Management Agency (FEMA) developed a plan in 1997 to modernize the FEMA flood hazard mapping program. The plan outlined the steps necessary to update FEMA's flood maps for the nation to digital format and streamline FEMA's operations in raising public awareness of the importance of the maps and responding to requests to revise them. Since that time, the plan has continually evolved as new products, processes, and technical specifications have been developed and implemented within present funding levels, which have not approached the levels necessary to fully update the national map inventory. This report summarizes the progress made toward implementing the plan during Fiscal Year 2000 and part of Fiscal Year 2001.

Section 1 of the report overviews the plan, identifies the organizations that have provided written support for the plan, and summarizes the benefits of the plan and the funding requirements.

In developing the Map Modernization Plan, FEMA conceptualized the Cooperating Technical Partners (CTP) (formerly called the Cooperating Technical Community [CTC]) initiative to increase involvement through strong, formalized Federal-State-regional-local partnerships. The intent of the CTP initiative is to facilitate and capitalize on these State, regional, and local efforts, and coordinate them with FEMA's flood mapping efforts in a consistent way, rather than on an ad-hoc basis. This will result in strengthened mapping and floodplain management programs and, thus, should reduce flood losses and disaster assistance. Since FEMA conceptualized the CTP initiative in Fiscal Year 1999, the number of CTPs has quickly grown to 62. Section 2 discusses the CTP initiative and summarizes some of the more significant CTP activities underway or planned as of September 30, 2000.

To achieve cost-effective mapping and flood hazard modeling, FEMA is employing existing, and exploring emerging, technologies for each component of a modernized flood map (base, topography, flood data). Section 3 discusses the role of technology in FEMA's flood mapping program.

The mission of FEMA's Map Service Center (MSC) is to improve service to its customers while streamlining operations using the latest technical innovations. The MSC vision includes a state-of-the-art digital distribution center. Section 4 overviews the progress made by the MSC.

The Technical Mapping Advisory Council (the "Council") was established by Congress in the National Flood Insurance Reform Act (NFIRA) of 1994 to provide recommendations to FEMA on how to improve the accuracy, quality, distribution, and use of Flood Insurance Rate Maps (FIRMs). The Council began its work in 1996 and has submitted recommendations to the Director of FEMA in each of its Annual Reports. Section 5 presents the Council's recommendations and FEMA's progress to date in addressing the recommendations.

## **Modernizing FEMA's Flood Hazard Mapping Program—A Progress Report**

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The results of FEMA's Office of Inspector General (IG) audit of FEMA's cost estimate for implementing the map modernization plan are presented in a booklet entitled "Audit of FEMA's Cost Estimate for Implementing the Flood Map Modernization Plan," dated September 2000. The objectives of the audit were to determine if FEMA's cost estimate (1) was based on reasonable mapping requirements; (2) included reasonable assumptions and accurate cost estimates and calculations; and (3) incorporated lower-cost alternatives and cost-saving technologies, where feasible. The results of the audit for each of these objectives are summarized in Section 6.

In 1998, FEMA identified a list of objectives for implementing the modernization plan. Based on accomplishments to date and current map modernization priorities, FEMA has updated the list of map modernization objectives, as indicated in Section 7 of this report.

## Acronyms Used in This Report

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ASFPM	Association of State Floodplain Managers
CBRS	Coastal Barrier Resources System
CIS	Community Information System
CMIX	Coordinating Mapping Information Exchange
CRS	Community Rating System
CTC	Cooperating Technical Community
CTP	Cooperating Technical Partner
CTS	Cooperating Technical State
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Map
DOQQ	Digital Orthophoto Quarter Quadrangle
EMI	Emergency Management Institute
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FY	Fiscal Year
GIS	Geographic Information System
H&H	Hydrologic and Hydraulic
HQ	Headquarters
IFSAR	InterFerometric Synthetic Aperture Radar
IDIQ	Indefinite Delivery Indefinite Quantity
LIDAR	Light Detection and Ranging
LOMA	Letter of Map Amendment
LOMR	Letter of Map Revision
LOMR-F	Letter of Map Revision – based on Fill

## Modernizing FEMA's Flood Hazard Mapping Program—A Progress Report

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MCC	Mapping Coordination Contractor
MICS	Monitoring Information for Contracted Studies
MNUSS	Mapping Needs Update Support System
MOU	Memorandum of Understanding
MSC	Map Service Center
NDEP	National Digital Elevation Program
NDOP	National Digital Orthophoto Program
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act
NGS	National Geodetic Survey
NMAS	National Map Accuracy Standard
NRC	National Research Council
NSRS	National Spatial Reference System
NSSDA	National Standard for Spatial Data Accuracy
OMB	Office of Management and Budget
QA/QC	Quality Assurance/Quality Control
RE	Regional Engineer
REHA	Riverine Erosion Hazard Area
RO	Regional Office
SC	Study Contractor
SOW	Statement of Work
TIN	Triangular Irregular Network
USGS	U.S. Geological Survey

# Modernizing FEMA's Flood Hazard Mapping Program—A Progress Report

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### 1.0 Introduction

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#### 1.1 Background

In 1997, the Federal Emergency Management Agency (FEMA) designed a plan to modernize the FEMA flood mapping program. Since that time, the plan has continually evolved as new products, processes, and technical specifications have been developed and implemented within present funding levels. This report summarizes recent developments, presents FEMA's enhanced map production processes, and provides a status report on the map modernization objectives.

FEMA's flood maps have served the nation well for insurance and flood disaster mitigation and relief. With implementation of the map modernization plan, the flood hazard information provided to communities will be more accurate and extensive, resulting in safer communities. The plan is a 7-year upgrade to the 100,000-panel flood map inventory and an enhancement of products, services, and processes that entails:

- Converting the maps to a digital format for approximately 14,000 communities (74,500 map panels)—this includes resolving community-identified map maintenance needs for 16,500 map panels);
- Conducting flood data updates and producing digital flood maps for approximately 3,300 communities with inadequate floodplain mapping (17,500 map panels);
- Developing digital flood maps for approximately 2,700 flood-prone communities without flood maps (13,700 map panels);
- Integrating communities, States, and regional agencies into the mapping process through the Cooperating Technical Partner (CTP) (formerly called the Cooperating Technical Community [CTC]) initiative;
- Converting the maps to metric, as required by Executive Order 12770, and to the North American Vertical Datum of 1988; and
- Improving customer service to make the maps easier to obtain and use, including electronic and digital printing and distribution.

Over the 7-year modernization period, the entire inventory will be converted to a digital format. Additionally, approximately 13,700 new digital panels will be created for flood-prone communities that do not currently have flood maps.

The integration of the map modernization plan objectives into the flood mapping program will result in:

- ✓ Reduced potential for loss of life and property
- ✓ Increased flood insurance policy base
- ✓ Reduced National Flood Insurance Program (NFIP) costs
- ✓ Reduced disaster costs
- ✓ Premiums commensurate with risk
- ✓ Meeting of legal mandates (conversion of maps to metric as per Executive Order 12770, "Metric Usage in Federal Government Programs")
- ✓ Protection of the natural and beneficial values of floodplains

- ✓ Increased awareness of flood hazards

### 1.2 Support for FEMA's Map Modernization Plan

FEMA has sought critical and analytical input for the map modernization plan from all users of the maps, but especially from members of the Congressionally mandated Technical Mapping Advisory Council, who served as advisors in the development of the plan. FEMA's map modernization plan has received widespread and enthusiastic support. Organizations that have provided written support for the plan include:

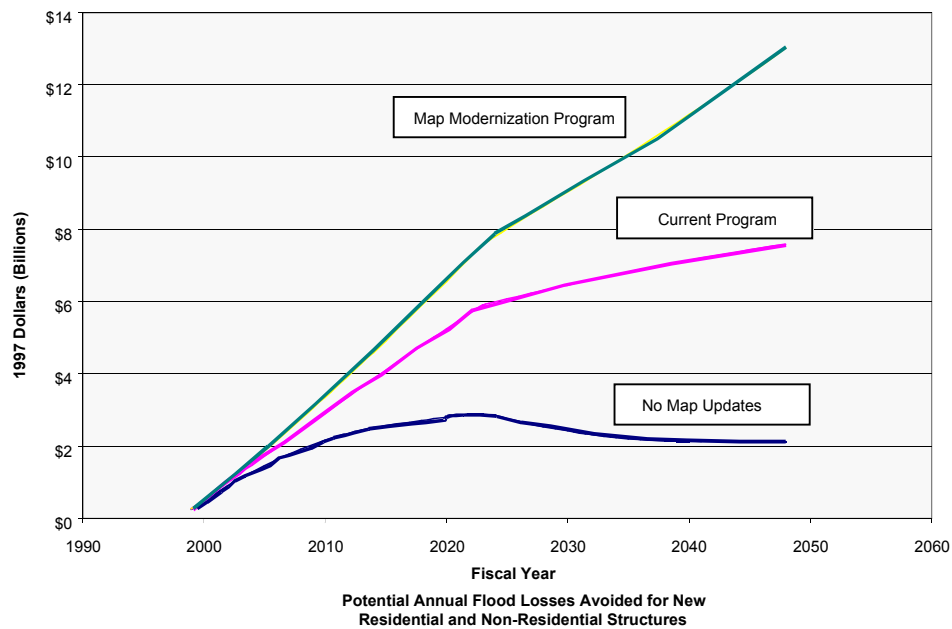
- ✓ Technical Mapping Advisory Council
- ✓ American Congress on Surveying and Mapping
- ✓ American Society of Civil Engineers
- ✓ Association of State Floodplain Managers
- ✓ Illinois Department of Natural Resources
- ✓ Illinois General Assembly
- ✓ National Association of Counties
- ✓ National Association of Flood and Stormwater Management Agencies
- ✓ National Emergency Management Association
- ✓ National Flood Determination Association
- ✓ National League of Cities
- ✓ National Lenders' Insurance Council
- ✓ Ohio River Basin Water Management Council
- ✓ Oregon's Seventieth Legislative Assembly
- ✓ U.S. Geological Survey
- ✓ Western Governors' Association

### 1.3 Benefits

Subsequent to the development of the map modernization plan, FEMA staff performed an assessment of the benefits and costs of implementing the plan. This assessment was documented in the December 1997 report "Modernizing FEMA's Flood Hazard Mapping Program, An Assessment of Benefits and Costs." The assessment, which was conducted in accordance with Office of Management and Budget Circular No. A-94, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," indicated that the benefits of the plan to the nation significantly outweigh the costs of implementing the plan. The analysis used the most up-to-date data available at that time regarding the projected needs of the flood map inventory, which were based on surveys of 10% of the mapped communities. The analysis estimated the benefit-to-cost ratio of the plan to be 2.1 to 1.

## Modernizing FEMA's Flood Hazard Mapping Program—A Progress Report

Since 1997, FEMA has surveyed 100% of the mapped communities for their mapping needs, and performed an updated benefit/cost assessment, which was documented in the March 2000 “Modernizing FEMA’s Flood Hazard Mapping Program: An Updated Assessment of the Benefits and Costs.” The assessment clearly indicates that the benefits to the nation, the most compelling of which is the potential to spare property from flood damage, dramatically outweigh the costs of the plan. The map modernization plan will help avoid approximately \$26 billion in flood damages to new buildings over a 50-year period. Figure 1 depicts the implications of not implementing the map modernization plan. Moreover, each year of delay in implementation of the plan reduces long-term potential benefits by approximately \$1.5 billion and adds approximately \$17 million to the total cost of the plan.

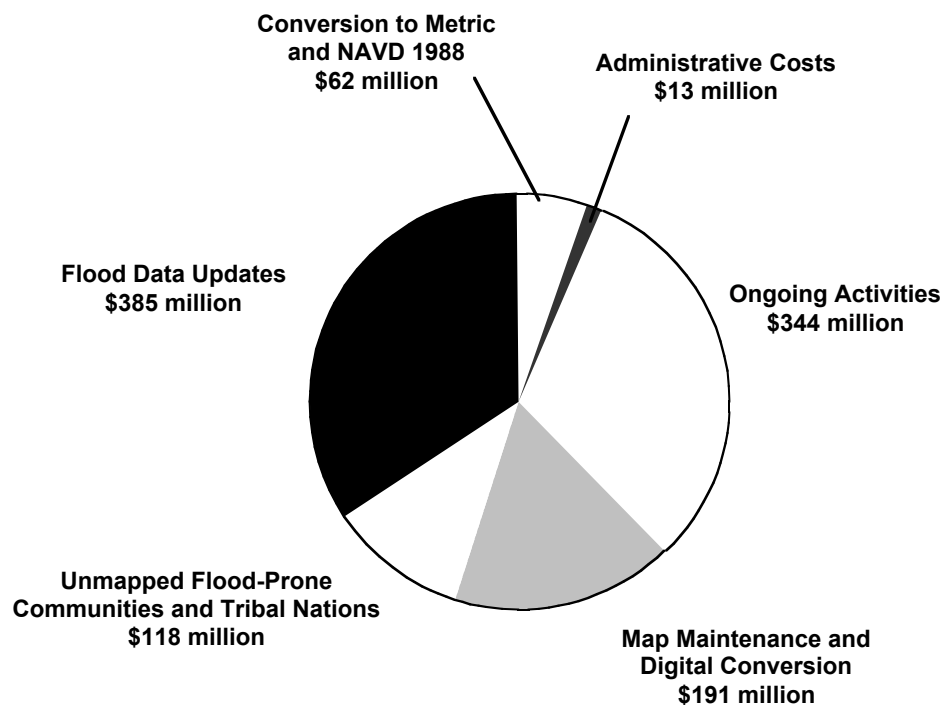


**Figure 1. Implications of Not Implementing the Map Modernization Plan**

The map modernization plan also supports FEMA's mission-related strategic goals and associated strategies. Improving the flood mapping program also supports the ***Project Impact*** initiative and will also strongly support FEMA's initiative to reduce the number of structures suffering **repetitive flood losses**.

### 1.4 Funding Requirements

Current funding levels are inadequate to address projected mapping needs of the NFIP. Thus, without infusion of additional funding, the backlog of outdated maps will continue to grow. Total incremental costs above current funding levels from Fiscal Year (FY) 2002 through FY 2008 are estimated at a minimum of \$750 million. Over the planned 7-year map modernization implementation period, total program costs will be about 3 times greater than the expected annual funding levels of \$52 million. Figure 2 summarizes the major cost components to fully implement the modernization plan over a 7-year period.



**Figure 2. Major Cost Components To Implement the Map Modernization Plan**

Although all taxpayers benefit, only a small minority currently pays for the flood mapping program. Ideally, funding for the map modernization plan will assess a fair portion of the costs to all beneficiaries.

If the map modernization plan is not funded, a significant portion of these flood damages will result in increased use of the Disaster Relief Fund and uninsured losses to property owners. Thus, the map modernization plan will have far-reaching effects in reducing all types of flood losses and will be a valuable expenditure for the nation.

## **Modernizing FEMA's Flood Hazard Mapping Program—A Progress Report**

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For FY 2000, Congress authorized \$50 million collected from the \$30 Federal Policy Fee and the “Fee Charge System” (fees charged for maps and mapping-related products and services) for Flood Hazard Mapping. In addition, Congress authorized \$15 million from the Disaster Relief Fund for Flood Map Modernization activities in areas impacted by Presidentially declared disasters. Finally, Congress authorized \$17.7 million for flood mapping from fee income that was collected from 1994 to 1998 but never spent. Thus, for FY 2000, \$82.7 million was authorized, as compared to \$191.3 million estimated for the first year of Map Modernization to complete the plan within 7 years.

## **2.0 Cooperating Technical Partner Initiative**

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Many States, communities, and regional entities, at their own expense, have invested considerable resources in recent years to identify flood hazards and update flood hazard information. In developing the Map Modernization Plan, FEMA conceptualized the Cooperating Technical Partners (CTP) initiative to increase involvement through strong, formalized Federal-State-regional-local partnerships. The intent of the CTP initiative is to facilitate and capitalize on these State, regional, and local efforts and coordinate them with FEMA's flood mapping efforts in a consistent way, rather than on an ad-hoc basis. This will result in strengthened mapping and floodplain management programs and, thus, should reduce flood losses and disaster assistance. Since FEMA conceptualized the CTP initiative in Fiscal Year 1999, the number of CTPs has quickly grown to 64.

Most CTP Task Agreements are and will be collaborative efforts where both the CTP partner and FEMA contribute data and units of work to maximize the extent, accuracy, and utility of flood studies to best meet local and Federal needs, while minimizing costs. FEMA may fund mapping activities that result in the development of specific flood map products, such as updated digital Flood Insurance Rate Maps (FIRMs), or products that can be used to make flood maps, such as topographic data or engineering analyses. FEMA is not funding staff positions or map maintenance activities, such as Letter of Map Revision (LOMR) review.

In FY 1999, FEMA allocated \$400,000 of Cooperative Funding to CTPs for pilot activities. In FY 2000, FEMA allocated its entire budget for new flood hazard study starts (\$3.5 million) to partners for CTP activities. Further, approximately \$5.3 million of Federal disaster relief funds are being used by States to develop updated flood data and mapping to assist recovery efforts. These efforts are being supported by the CTP initiative to maximize the benefits derived by the use of these funds. FEMA is also contributing program development and technical support to CTP activities through in-kind services provided by the Map Coordination Contractors; these in-kind contributions enhance the capabilities of the partners, allowing them to take ownership of the flood maps. Additionally, some CTPs are engaging State agencies and other Federal agencies as partners to contribute cash and in-kind technical support. For example, the State of North Carolina has engaged the U.S. Geological Survey as a partner to produce updated digital orthophoto quadrangle maps through the National Digital Orthophoto Program. These new maps will be used as base maps for producing updated digital FIRMs.

This cost-shared approach to funding flood mapping activities allows FEMA, the CTP, and other State and Federal agencies to leverage their available resources, eliminate duplicative efforts, and maximize output. On a nationwide basis, CTPs are funding approximately 60% and FEMA approximately 40% of the cost of CTP flood mapping activities. Thus, for every \$1 invested by FEMA, \$2.40 worth of updated flood mapping is being produced.

## **Modernizing FEMA's Flood Hazard Mapping Program—A Progress Report**

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FYs 1999 and 2000 were the pilot years for the CTP initiative. CTP activities are underway nationwide; the following is a summary of some of the more significant activities underway or planned as of September 30, 2000.

### **State of North Carolina**

The State of North Carolina has been designated as the first Cooperating Technical State (CTS). Through its CTS agreement, the State has engaged more than 20 other Federal and local partners and initiated a 5-year, \$65 million program to develop updated base maps, detailed topographic data, updated flood data, and seamless digital FIRM coverage statewide. They are also developing an Information Management System to disseminate the information via the Web. In August 2000, the North Carolina General Assembly allocated \$23 million to initiate the program for Phase I, which encompasses the six eastern river basins in the State (about half the State's land area), 55 counties, and 369 communities. FEMA has contributed \$5.3 million as well as in-kind contribution of engineering, mapping, and program design services for Phase I of the State's program. Because the State's program will extend beyond flood mapping to include development of information useful for other applications, such as statewide Digital Elevation Models (DEMs) and orthophoto base maps, the State is working toward securing additional funding with its other Federal partners. The State will fund approximately 66% of the cost, and FEMA will fund the remaining 44%; therefore, this project provides FEMA a return on its investment greater than the national CTP average of 60% CTP and 40% FEMA.

### **Del Norte, California**

The Del Norte County Community Development Department and FEMA staff are conducting a restudy of flood hazards along a 21-mile length of the Smith River near the City of Crescent City and a 3-mile length of Rowdy Creek, a tributary to the Smith River. Under its agreement with FEMA, the Community Development Department staff will develop digital cross section data, digital topographic data, and digital base maps. FEMA will use the digital cross section data, topographic data, and base maps as part of its detailed study of flood hazards along the Smith River and Rowdy Creek. FEMA will develop new hydraulic models and flood mapping, and will produce a new digital Flood Insurance Rate Map for Del Norte County.

### **Dupage County, Illinois**

Dupage County, IL, will produce updated flood mapping in two phases. In Phase I, Dupage County community FIRMs are being combined into a countywide FIRM, floodplain delineations are being updated based on updated topographic data, and the resulting countywide FIRM is being digitized. In Phase II (a multi-year effort), the county will update the hydrology and hydraulics (H&H). The new modeling will be done using hybrid statistical modeling (PVSTATS and HSPF) and FEQ. The complete, countywide digital FIRM is expected to be produced in 2001. A pilot area has already been completed, and the county expects to complete work on a 13-square-mile drainage basin by June 2001.

### **Hillsborough County, Florida**

In 1998, Hillsborough County initiated a detailed restudy of 17 watersheds within the county. New base mapping will be compiled from 1:1,000 scale aerial photographs. When the project is complete, 190 miles of additional detailed riverine flood hazards will be mapped for a total of 370 miles in the county. FEMA will use the county's studies to produce 177 new digital FIRM panels, which will also incorporate more than 1,000 Letters of Map Change.

### **Indianapolis, Indiana**

FEMA has an agreement with the City of Indianapolis to perform H&H analyses. The FEMA-funded effort is just one of three H&H projects now underway by the community. The City has wanted this kind of program since the mid 1990s, when its GIS programs became inter-departmental and FEMA concurrently announced resolution of long-standing compliance concerns. The community is now exemplary in its administration of the flood damage prevention ordinance. The long list of study priorities it has identified is intended to facilitate future permit reviews using GIS-based technologies.

### **Lower Colorado River Authority, Texas**

This regional agency was one of the first CTPs. They represent 11 counties in central Texas. In the first year, they completed a mapping needs assessment for one of their counties and a 19-panel draft digital FIRM for the City of Lago Vista. Currently, they are working on a digital FIRM for the City of Meadow Lakes and a planning study for the cost of remapping the remainder of their 11 counties.

### **Missouri State Emergency Management Agency (SEMA) and the Nebraska Natural Resources Commission (NRC)**

These State agencies have CTP agreements to expand on their countywide mapping efforts using cost-effective, automated techniques developed by the Nebraska NRC to rapidly produce new approximate flood zones. Each State has previously completed studies on its own. In Missouri, the preliminary digital FIRM for Dade County has been published and the preliminary digital FIRM for Cedar County is in final review at SEMA.

Using the methods developed by the Nebraska NRC, Missouri and Nebraska will produce countywide maps for 15 counties. For 11 of the 15 counties, this will be the initial identification of the flood hazards, which will allow them to join the Regular Phase of the National Flood Insurance Program (NFIP). This is also true for about 5% of incorporated areas within the counties as well. Approximately 85 to 100 municipalities will be included on the 15 countywide maps.



### **New York State Department of Environmental Conservation**

The CTP agreement between New York State Department of Environmental Conservation and FEMA is to develop topographic data using LIDAR technology; prepare updated flood hazard data using automated, GIS-based engineering analyses; and produce countywide Digital Orthoimage FIRMs (DOFIRMs) for designated watersheds. The initial effort will entail three counties. For these three counties, the output will be approximately 240 digital FIRM panels. Over the long term, the State intends to expand its flood mapping program statewide.

### **Riley County, Kansas**

Riley County is taking advantage of their existing GIS resources to integrate the results of three existing preliminary flood studies within the county into a countywide map. The county is following the new digital FIRM spatial database standards in their data production. Their finished product will be one of the first finished products using the new FEMA standard.

### **Santa Clara Valley Water District, California**

The Santa Clara Valley Water District (SCVWD) is working with a FEMA Study Contractor and FEMA to conduct detailed H&H analyses and prepare floodplain mapping for Los Gatos Creek in the City of Los Gatos, California. SCVWD has completed the hydrologic analyses required to determine the outflow from Vasonna Dam and intermediate points downstream, as necessary. The results of the District analyses are being used by the FEMA Study Contractor for the hydraulic analyses and floodplain mapping.

### **Complex Systems Research Center, University of New Hampshire**

In 1999, the Complex Systems Research Center (CSRC), a branch of the University of New Hampshire, entered into a pilot CTP agreement with FEMA to convert the effective FIRMs for three New Hampshire communities to a digital format that conforms to FEMA's new digital FIRM specifications. The agreement covered the digitization of 10 FIRM panels for the communities of Salem, Windham, and Atkinson, all in Rockingham County. Under the agreement, CSRC also incorporated the results of Letters of Map Change that had been issued by FEMA since the publication of the effective FIRMs for the three communities. In 2000, CSRC and FEMA entered into a new digital FIRM preparation agreement. This new agreement is for the digitization of 81 FIRM panels for Rockingham County and 70 FIRM panels for Strafford County, New Hampshire.

### **Borough of Staten Island, New York**

In 1999, the Borough of Staten Island, New York, and FEMA entered into a CTP agreement to refine and/or eliminate floodplains designated Zone A from the effective FIRM for Richmond County, Borough of Staten Island. The Zone A boundaries had been delineated from the State of New York Freshwater Wetland Maps. Subsequent to the publication of the effective FIRM for Staten Island, FEMA was notified that the wetland maps were in error and, therefore, the Zone A floodplain boundaries were delineated incorrectly.

Staten Island provided FEMA with a written summary of the Zone A areas in need of investigation, and provided technical support and assistance as needed. FEMA conducted onsite investigations to verify the wetlands delineations and performed new analyses for storm sewers within the community that contained flooding discharges. Then FEMA digitized the FIRM and issued a Preliminary version of the Digital FIRM to the community for review on September 7, 2000. The final Digital FIRM will become effective on May 21, 2001.

### **Unified Sewerage Agency of Washington County, Oregon**

The Unified Sewerage Agency (USA) of Washington County is conducting surveys, performing detailed H&H analyses, and preparing floodplain and floodway mapping for 166 square miles of the Tualatin River Basin. USA completed the survey in four months. USA, using private consultants, will have new hydrologic data developed for the basin using the HSPF and HEC-HMS modeling. In performing the study, USA will apply GIS-based hydraulic modeling and mapping techniques to develop digital datasets to support the automation of modeling and floodplain mapping.

### **Urban Drainage and Flood Control District, Denver, Colorado**

The Urban Drainage and Flood Control District (UDFCD) of Denver has become the primary liaison with FEMA for flood hazard identification and floodplain mapping activities in 32 participating communities (counties, cities, and towns) in Colorado. In this capacity, UDFCD is working closely with FEMA and the communities to identify flood study needs and, in some cases, conduct those studies. Under the agreement, FEMA and UDFCD also have established procedures for new H&H studies to be conducted by UDFCD, including standards for the inclusion of future-conditions hydrology in the flood study and on the flood maps. As a first step, UDFCD is conducting a survey to determine the capabilities of the 32 community governments to produce digital base maps for use in preparing digital FIRMs. Based on that information, FEMA and UDFCD will jointly determine the order in which digital FIRMs will be produced for these communities.

### ***Training and Technology Transfer***

It is estimated that approximately 5% of the communities participating in the NFIP have the ability to be a true partner with little or no guidance or assistance from FEMA. The remaining 95% have a wide range of abilities and will require a varying amount of technical assistance. Thus, to enhance local capabilities, FEMA developed a training course for CTP partners through the Emergency Management Institute. This course provides training on how to manage the flood mapping processes and the CTP agreement with FEMA as well as technical modules on how to develop flood mapping products that comply with FEMA requirements.

## **Modernizing FEMA's Flood Hazard Mapping Program—A Progress Report**

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The weeklong course was held in May, July, and October 2000. Approximately 75 attendees, representing 47 State, local, and regional agencies, attended these training sessions. The weeklong course will again be offered at the Emergency Management Institute in August 2001. Additionally, workshops will be given at the Association of State Floodplain Managers' Conference in Charlotte in June 2001.

Training materials are also available to Regional staff in a "pack-and-go" format for use by FEMA and its contractors to allow flexible training of FEMA's CTPs. As mentioned previously, program development, data, and technical support are made available to CTPs through the FEMA Map Coordination Contractors.

### ***Public Awareness***

Because of the considerable interest in the CTP initiative, FEMA has been aggressively pursuing an outreach campaign. Regional staff have started a "grass roots" campaign to proactively involve the most progressive, technically capable partners as CTPs, and the number has quickly grown to a total of 64 partners, of which 36 are local counties and communities, 17 are state agencies, 10 are regional agencies, and 1 is a university.

### ***Planned Activities for FY 2001***

FEMA intends to leverage, to the extent possible, the \$17.7 million in fees collected but unexpended during FYs 1994-98 authorized by Congress for expenditure in the FY 2001 budget for cost-sharing with CTPs to produce updated flood maps. In addition, FEMA plans to complete the following activities during FY 2001:

- Additional training at EMI and the Association of State Floodplain Managers (ASFPM) Annual Conference in Charlotte, North Carolina;
- Improvement of guidance documents;
- Redesign of CTP segment of Flood Hazard Mapping web site to improve outreach and information distribution; and
- Completion of new outreach materials, including materials targeted to assist potential partners in determining whether the CTP initiative is right for them.

### 3.0 Role of Technology in the Flood Mapping Program

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To achieve cost-effective mapping and flood hazard modeling, FEMA is employing existing, and exploring emerging, technologies for each component of a modernized flood map (base, topography, flood data).

**Base Map:** FEMA is partnering with the U.S. Geological Survey (USGS) for assistance in developing and maintaining base maps. The USGS is the primary Federal agency producing and distributing Digital Orthophoto Quarter-Quadrangles (DOQQs). A DOQQ is a computer-generated image of an aerial photograph in which displacements caused by camera orientation and terrain have been removed. These products combine the image characteristics of a photograph with the geometric qualities of a georeferenced map and can be used in numerous Geographic Information System (GIS) applications. FEMA is participating with the USGS in the National Digital Orthophoto Program (NDOP), which was established to ensure the public domain availability of DOQQ data for the nation. FEMA has programmed \$8 million of Map Modernization funding for partnership with USGS, States, and communities to develop and maintain DOQQs through NDOP. DOQQs are available for more than 80% of the United States.

**Topography:** FEMA is evaluating remote-sensing technologies to determine their costs and accuracy for collecting elevation data. FEMA is cooperating with NASA's Jet Propulsion Laboratory and the U.S. Army Corps of Engineers' Topographical Engineering Center (TEC) in developing LIDAR (Light Detection and Ranging) and IFSAR (Interferometric Synthetic Aperture Radar) technologies. With the National Imagery and Mapping Agency (NIMA), FEMA is cooperating in the development of vegetation-penetrating IFSAR at two test sites.

FEMA has developed LIDAR specifications for FISs, DEMs, and other NFIP products. The specifications are performance-based calling for 30-cm (approximately 1 foot) accuracy. The LIDAR specifications are being used in the NC CTS mapping project. The aerial mapping and surveying specifications are being updated to include GPS, DOQQs, LIDAR, and IFSAR DEMs.

While the remotely sensed data provide accurate topographic data of the floodplains cost-effectively, they will not provide bathymetric (i.e., elevation data below water surfaces, such as channel bottoms) or hydraulic structure (i.e., bridges and structures) elevation data. This information is required for conducting detailed hydraulic analyses to establish flood elevations. Thus, GPS surveying techniques will be used to obtain these data, which will be integrated with the remotely sensed data for floodplain areas.

FEMA has programmed \$110 million in Map Modernization Plan funding for development of needed topographic data. The Map Modernization Plan cost estimate projects that the use of emerging technologies to develop digital topography will result in a 20% savings over current methods.

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**Flood Data:** FEMA is exploring the use of automated GIS-based hydrologic and hydraulic models integrated with digital watershed maps and digital elevation models, which may or may not be built from LIDAR/IFSAR elevation data. GIS-based hydrologic and hydraulic models create “living” models that are easy to revise as conditions change. They are also powerful tools for communities to quickly evaluate the impacts of various watershed and floodplain developments prior to construction. Many of FEMA's Study Contractors are currently using these automated models.

The Map Modernization Plan cost estimate projects that digital topography and GIS-based models will result in a 20% reduction in unit cost beginning in FY 2005.

**Digital FIRM:** Digital maps will allow FEMA to distribute the maps digitally via CD-ROM and through the Internet. They will also enable print-on-demand technologies. In addition, they will allow for automated applications for:

- Risk assessment and map determinations
- Disaster response and recovery
- Repetitive loss applications
- Planning and permitting

The digital FIRM will be supported by a fully integrated relational and engineering database.

## **4.0 FEMA's Map Service Center**

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FEMA's Map Service Center (MSC) distributes NFIP materials to a broad range of customers, including federal, state, and local government officials; real estate professionals; insurance providers; appraisers; builders; land developers; design engineers; surveyors; lenders; and the public. MSC products include digital FIRMs, FIRMs, Flood Insurance Study (FIS) reports, Digital Q3 flood data, Community Status Book, Flood Map Status Information Service (FMSIS), Letters of Map Change (LOMCs), and NFIP Insurance Manuals.

As part of FEMA's Map Modernization Plan, the MSC's mission is to improve service to its customers while streamlining operations using the latest technical innovations. The MSC vision includes a state-of-the-art digital distribution center.

On February 12, 2001, FEMA announced the MSC's World Wide Web site, one of a suite of online services planned to expedite the dissemination of FEMA's flood map and insurance products. The MSC web site is a dynamic, customer-based service designed to provide the latest information and support services to users as part of FEMA's contribution to the National Information Infrastructure.

Mortgage lenders, realtors, settlement companies, and other business users of FIRMs can now order maps online through the site, which can be found at [www.fema.gov/msc](http://www.fema.gov/msc). Business customers also will be able to go online to check the status of their flood map orders. The service soon will be available for other groups of flood map users, including individual homeowners and government agencies.

The site's security architecture is based on best practices in the industry, uses the latest available technologies, techniques, and processes and was approved by FEMA's Information Technology division.

The next step is to scan and digitize the maps so customers can see them and download directly from the Internet, or order them on CD. Currently, it takes 5 to 7 days for customers to receive their order. Once the products are digitized and scanned, files can be delivered electronically to the desktop within 5 to 10 minutes.

## 5.0 Progress on Implementing Technical Mapping Advisory Council Recommendations

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The Technical Mapping Advisory Council (the “Council”) was established by Congress in the National Flood Insurance Reform Act (NFIRA) of 1994 to provide recommendations to FEMA on how to improve the accuracy, quality, distribution, and use of Flood Insurance Rate Maps (FIRMs). NFIRA mandated that the following individuals and organizations nominate candidates for membership on the Council:

- The Undersecretary of Commerce for Oceans and Atmosphere
- The American Congress on Surveying and Mapping (ACSM)
- The American Society of Civil Engineers (ASCE)
- The National Flood Determination Association (NFDA)
- The U. S. Geological Survey (USGS)
- The Association of American State Geologists (AASG)
- The Association of State Floodplain Managers (ASFPM)
- Bank of America
- The Federal Home Loan Mortgage Corporation (Freddie Mac)
- The Federal National Mortgage Association (Fannie Mae)

The Council's duration was from November 1995 through November 2000. The Council submitted recommendations to the Director of FEMA in each of its Annual Reports. The following presents the Council's recommendations and FEMA's progress to date in addressing the recommendations.

### 5.1 1996 Technical Mapping Advisory Council Recommendations

**1. Retention of Maps and Map Information.** Establish an archival system for maintaining in perpetuity, for historic and legal purposes, all Flood Insurance Rate Maps (FIRMs) and supporting technical data.

- ✓ Current Map Service Center (MSC) and Map Coordination Contractor (MCC) procedures are to maintain archives of all maps, reports, and supporting data. As resources allow, an indexing system for retrieval will be implemented.

**2. Distribution Processes.** Distribute Letters of Map Change (LOMCs) with each map ordered; individuals or companies that subscribe to automatic updates should automatically receive copies of pertinent LOMCs.

- ✓ Currently cost-prohibitive; long-term, all data will be available on the Internet.

**3 Forms.** Distribute, via the Internet, certification forms required for map revision requests.

- ✓ The [MT-EZ](#), [MT-1](#) and [MT-2](#) forms as well as Flood Insurance Study (FIS) [Data Request forms](#), [Elevation Certificates](#), [Flood Proofing Certificates](#), and [Standard Flood Hazard Determination forms](#) are available for downloading at FEMA's flood-hazard mapping web site (<http://www.fema.gov/mit/tsd>). They are available as .pdf files, .zip archives, and as Microsoft Word documents.

**4. H.R. 3340.** Develop a position on legislation that would delegate authority to issue LOMCs to entities other than FEMA.

- ✓ H.R. 3340 never passed
- ✓ A meeting was held on December 9, 1998, with the state of South Carolina and professional organizations to discuss the issues involved with LOMC delegation. A summary report was prepared and distributed on August 17, 1999 to the FEMA Regional Mitigation Divisions, the ASFPM Mapping Committee, and the Technical Mapping Advisory Council.
- ✓ FEMA will continue to examine all aspects of the LOMC processes and determine what can be modified to simplify the processes.

**5. Scribing.** Implement newer technologies than the scribing method for the production and dissemination of FIRMs.

- ✓ All updates to existing maps are produced digitally, where cost constraints allow.
- ✓ All newly created maps are produced digitally.
- ✓ MMP includes digitizing approximately 81,500 panels currently in manual format (approximately 18,500 converted to date) in FY 2001-2005, conditional on the availability of funding.
- ✓ A distribution plan for new digital FIRM products is under development.
- ✓ FEMA's Map Service Center (MSC) is investigating means of scanning maps and making them available on FEMA's web site.
- ✓ Draft digital FIRM graphics and database specifications developed for new digital map products.

### 5.2 1997 Technical Mapping Advisory Council Recommendations

**1. Flood Insurance Studies (FISs).** Improve the FIS process by shortening Study Contractor (SC) process; permitting multi-year contracts to SCs; ensuring agreement on base map among SC, Map Coordination Contractor (MCC), the state, FEMA, and the community earlier in the process; and providing for intermediate reviews of mapping elements.

- ✓ Multi-year study contract mechanism available to the FEMA regional offices for FY 2001 new study starts.
- ✓ Optimized Study Process. MMP objective has designed new process consisting of three components: Mapping Needs Assessment, Project Scoping, and Map Production. Features include:
  - Tasks to complete studies will be distributed to SC, CTP, and MCC to maximize expertise and capability of each.



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- Base map will be identified and agreed upon during FEMA's scoping coordination with the community and state.
- All participants in the study process will complete work concurrently (i.e., CTP digitizes effective information for non-restudied streams while SC completes restudy) to shorten time frames.
- Communities, states, and/or regional agencies will have the opportunity to review analyses and mapping at intermediate points in the study process.
- Will continue implementation of optimized process in FY 2001.
- Developed draft documents providing guidance for scoping flood mapping projects. Project scoping is intended to enable FEMA to achieve a "best value" for completing any mapping project by prioritizing and addressing a community's flood mapping needs, and distributing the work based on the strengths and capabilities of all available resources.

**2. Base Maps.** Improve base maps and review and update existing standards, in consultation with the Federal Geographic Data Committee (FGDC). Ensure strict adherence to the standards.

- ✓ Base Map Specifications finalized and distributed to the FEMA Regional Mitigation Divisions and the Council on May 26, 1999. Also on FEMA's web site at [www.fema.gov/mit/tsd/frm\\_bsmf.htm](http://www.fema.gov/mit/tsd/frm_bsmf.htm). Contain requirements for:
  - Contents,
  - Accuracy,
  - Currentness, and
  - Ability to distribute
- ✓ Community-supplied or state-supplied data that meet minimum requirements will be first choice.
- ✓ USGS DOQQs will be the default base map for community or state data that are unavailable or do not meet FEMA's base map specifications.
- ✓ The Draft Standard digital FIRM Spatial Database includes database attributes for required base map features and metadata. As part of the digital FIRM database design effort, FEMA reviewed FGDC standards for transportation features and will continue to coordinate with the FGDC regarding database attributes.

**3. Base Mapping Partnerships.** Pursue base mapping partnerships with other public, private, and nonprofit entities, such as the Census Bureau, U.S. Geological Survey (USGS), state, local, and regional agencies, to achieve cost efficiencies and exchange technical expertise.

- ✓ FEMA is participating in the USGS National Digital Orthophoto Partnership (NDOP) Program.
- ✓ Goal is to produce DOQQs for communities where a FEMA map update is planned and a community base map that meets FEMA's base map specifications does not exist.
- ✓ Meetings have been held with USGS to discuss partnering options for the acquisition of DOQQs to support FEMA's digital FIRM mapping needs.
- ✓ Digital Base Map Data Sharing and Digital Base Map Inventory are CTP mapping activities.

**4. Digital Flood Insurance Rate Map.** Digitally prepare, produce, and make available all new map products resulting from studies or restudies and physical map revisions.

- ✓ See 1996 Recommendation #5.
- ✓ Completing design of the new digital FIRM Product:
  - Will include base map, georeferenced flood data, database, and new graphic specifications.
  - Graphic specifications were completed in November 2000.
  - Standard digital FIRM database specifications completed April 2000.
  - Finalize and post digital FIRM standard database specifications on FEMA Map Modernization digital FIRM Website by June 1, 2001.
  - Enhanced digital FIRM database specifications underway.
- ✓ Map use policy to clarify issues for users as they migrate from paper to a digital environment is under review by FEMA.
- ✓ Draft distribution plan under development.

**5. Community Involvement.** Hold community meetings before, during, and after preparation of a new map product, such as a map digitized for the first time or one being converted to a countywide product, to enable community and state input to and participation in mapping issues and activities.

- ✓ As part of the Optimized Study Process (See 1997 Recommendation # 1), the “scoping phase” will include extensive, up-front coordination and outreach to the community.
  - For communities with flood data update needs and large countywide studies, the community coordination will typically be through a series of face-to-face meetings. The meetings will be attended by community officials, the SC, and state and/or regional agency officials.
  - For communities for which the map update will be a digital conversion and/or map maintenance with no flood data updates, the community coordination may be accomplished via teleconferences with the community, state and/or regional agencies, and the MCC.
  - The purpose of the coordination meetings (or teleconferences) will be to establish the scope of the project, including:
    - Validating map update needs;
    - Study reaches and methods for engineering analysis and floodplain mapping;
    - Topographic data sources;
    - Digital FIRM options to be included; and
    - Base map selection.

- The coordination meeting (or teleconference) will also be for FEMA to determine how to distribute the work required to complete the mapping project based on the strengths and technical capabilities of the available resources to achieve a “best value.”
- ✓ Communities will also be provided the opportunity to review data and mapping at intermediate points during production.
- ✓ Final meetings with communities and citizens will be held to present the preliminary maps and receive feedback prior to initiating the 90-day appeal period, as needed.

### 5.3 1998 Technical Mapping Advisory Council Recommendations

**1. Map Availability and Accuracy.** Implement programmatic changes to improve accuracy, reliability, and availability of digital and graphic map data. To include:

- New technology for preparing work maps and FIRMs;
  - Specifications for digital FIRMs;
  - Internet distribution of map data; and
  - Revision of Guidelines and Specification for Study Contractors (FEMA 37).
- ✓ Through the Advanced Remote Sensing Technologies Map Modernization objective, FEMA is assessing LIDAR, IFSAR, and LIDAR/IFSAR fusion for use in gathering topographic and base map information for FISs.
- LIDAR: Developed guidelines and specifications; published on FEMA's web site. Will update guidelines and specifications to test results and incorporate review comments. Will develop costing guidelines.
  - IFSAR and LIDAR/IFSAR Fusion: Contracted with the Jet Propulsion Lab through the Army Topographic Engineering Center to evaluate performance and to develop guidelines and specifications for FISs; flew mission over the Red River to collect data and evaluate performance. Continuing to evaluate Red River mission data; will develop and publish guidelines and specifications for FEMA 37; will develop costing guidelines.
- ✓ See 1997 Recommendation # 4 for description of new digital FIRM product.

**2. Minimum Base Map Standards.** Revise and ensure adherence to minimum base map standards, consistent with FGDC standards. To include:

- Minimally acceptable tolerances for positional accuracy;
  - Feature content;
  - Age of the map;
  - Metadata requirements;
  - Georeferencing requirements.
- ✓ Base maps will be produced in cooperation with other federal, state, and community partners.
- ✓ See 1997 Recommendation numbers 2 and 3.

**3. Mapping Needs Assessment Process.** Continue interaction with other entities; share and publicize preliminary results. Obtain approval from Office of Management and Budget (OMB) to collect information by questionnaire or other methods.

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- ✓ First five-year cycle completed.
- ✓ Prepared summary fact sheets of survey results for NFIP state coordinators and members of Congress.
- ✓ Developed report to Congress.
- ✓ Presented survey results at ASFPM 1999 and ASFPM 2000 Conferences.
- ✓ Working with FEMA Forms Management to develop community questionnaire for use in second five-year cycle; coordination with OMB will follow.
- ✓ Developed CTP Mapping Activity Statement for Assessment of Community Mapping Needs; pilot tested by state partners in FY 1999; and fully implemented in FY 2000.
- ✓ Developed guidance document, "Analysis and Evaluation of Community Flood Mapping Needs," to assist CTP and FEMA contractors to objectively evaluate flood-hazard mapping needs.
- ✓ Two states are represented on the Map Needs Assessment Workgroup.
- ✓ Presented the Map Needs Assessment Process at CTP Training Courses held in May and July 2000.
- ✓ Provided a group of State Coordinators with access to MNUSS and conducted tutorials on how to enter mapping needs into the system.

**4. Public Awareness.** Devote education efforts to increasing public awareness of the real possibility of flooding beyond the Special Flood Hazard Area (SFHA) in any given year.

- ✓ All LOMCs removing land and/or structures from the SFHA include wording regarding the possibility of flooding beyond the SFHA and suggest the purchase of flood insurance.
- ✓ FEMA's Mitigation Directorate has established an Outreach Branch.
- ✓ FEMA's flood-hazard mapping web site contains extensive educational information specifically targeted for homeowners, insurers and lenders, engineers and surveyors, and floodplain managers.
- ✓ FEMA's Map Assistance Call Center is a resource for property owners, insurers and lenders, engineers and surveyors, and floodplain managers to ask specific questions. The Call Center can directly link customers to the FIA Response Center for additional information on flood insurance.
- ✓ Future-conditions hydrology standards are being developed (See 1999 recommendation #1).
- ✓ Flood insurance marketing efforts-main message in advertisements is that it can flood anywhere, anytime.
- ✓ Agent and Lender Workshops are conducted nationwide to disseminate up-to-date information to those involved with the NFIP. These workshops contribute to the increasing awareness and improving knowledge of flood insurance
- ✓ FEMA's "National Hurricane Survival Initiative" is a first-of-its-kind public service campaign to educate residents along the Eastern Seaboard and Gulf Coast about hurricane safety and damage prevention.

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- ✓ In January 2000, new consumer print ads, designed to motivate people to take action against flooding, started appearing in national magazines. New print ads that target insurance agents and lenders began appearing a few months after the new consumer print ads.
- ✓ Through Project Impact, citizens, community organizations, business and industry, all levels of government, and the media are working together to make communities safer places to live.

**5. Stream Gages.** Preserve and maintain existing stream gages and increase density of the streamgaging system. Consider incorporating rapid telemetry of gage data into existing and future stations.

- ✓ FEMA unable to implement; USGS's responsibility.
- ✓ FEMA will continue to support and encourage USGS efforts to preserve and maintain the streamgaging network

**6. Maintenance of Flood-Control Projects.** Work with U.S. Army Corps of Engineers (USACE) to review permitting process under Section 404 of the Clean Water Act and to develop 404 permit regulations that exempt maintenance of FEMA-credited, flood-control projects.

- ✓ USACE currently has proposed rule on changes to 404 permits; FEMA coordinating internally and with other federal agencies to provide comments. This proposed rule change does not address permit exemptions for maintenance of flood-control projects.
- ✓ No formal action currently being taken by FEMA/USACE.

**7. Collaboration in Flood-Hazard Mapping.** Be more proactive in involving communities and state organizations in the flood mapping process from its inception through completion.

- ✓ The Optimized Study Process (See 1997 recommendation # 1) will involve communities, state agencies, and regional agencies in the entire process, allowing them to help determine the study scope, review intermediate analyses and mapping, and participate in the actual analysis, data collection, and/or mapping as CTPs.
- ✓ The CTP Initiative will form formal partnerships with communities, states, and/or regional agencies to fully integrate them into FEMA's flood-hazard mapping process:
  - Designated CTPs for FY 1999 and FY 2000 pilot CTPs.
  - Completed Mapping Activity Statements for ten specific types of CTP mapping activities.
  - Conducted programmatic and technical training for CTPs and potential CTPs at FEMA's Emergency Management Institute. Two sessions were held in May and July 2000. Another session scheduled for October 2000.
  - Developed the CTP component of the FEMA flood-hazard mapping web site.
  - Most extensive undertaking to date is a Cooperating Technical State agreement with the State of North Carolina whereby North Carolina will conduct flood studies and prepare Digital FIRMs for its communities and provide the data to FEMA.

**8. Post-Disaster Verification of Flood Hazard Data.** Allocate funds specifically for post-disaster verification activities to:

- Gather data and document event;
- Assess the accuracy of the maps; and
- Revise applicable maps.

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- ✓ U.S. House of Representatives is proposing transfer of \$30 million from the Disaster Relief Fund (DRF) to the Map Modernization Fund as part of FEMA's FY 2001 budget. H.R. 4635 has been referred to the Senate, but the Senate has not yet responded.
- ✓ FEMA is developing a standard procedure for verifying the accuracy of the FIS and FIRM for flooded communities declared disaster areas by the president and, if necessary, for revising the FIS and FIRM.
- ✓ FEMA is developing a Web page to provide several tools to field engineers in a disaster setting. Some of these tools include:
  - Background information on Post Disaster Verification of Flood Hazard Data and the value of flood recovery data collection
  - Statement of Work (SOW) templates and examples that can be downloaded from the site and customized to meet specific field engineer or disaster specifications.
  - Example scenarios to walk field engineers through the various SOWs and processes of flood recovery data collection.
- ✓ Completion of the Web page and SOW templates was completed at the end of FY 00.
- ✓ In the States of New York and New Jersey, following Hurricane Floyd, FEMA collected field data and compared the data to the effective Flood Insurance Studies and FIRMs. FEMA is now in the process of updating the maps for high priority needs.

### 5.4 1999 Technical Mapping Advisory Council Recommendations

**1. Future-Conditions Hydrology:** *The Council recommends that FEMA support and encourage the use of future land-use conditions in determining the hydrology for floodplain delineations.*

- Prepared a draft report, "Recommendations for Using Future Conditions for the National Flood Insurance Program," May 14, 1999.
- Recommendations from this report are being incorporated into a Proposed Rule. This Proposed Rule has not yet been published in the Federal Register.

**2. Unnumbered A-Zones (No Base Flood Elevations):** FEMA should strive to improve or eliminate all Unnumbered A-Zones without base flood elevation (BFE) data.

- ✓ Formed a Work Group to examine options for addressing issues related to Approximately Studied (Zone A) Areas.
- ✓ Developed recommendations for addressing Zone A areas, which were summarized in a paper presented at the Fall 1999 FEMA Regional Engineer's Conference.

**3. Alluvial Fans:** The Council endorses FEMA's formal adoption of its July 17, 1999 publication entitled: [Guidelines for Determining Flood Hazards on Alluvial Fans](#).

- ✓ Developed an approach to identify and map flood hazards on alluvial fans that accounts for site-specific conditions. The approach, detailed in the [Guidelines for Determining Flood Hazards on Alluvial Fans](#), addresses recommendations in a 1996 report by the National Research Council's Committee on Alluvial Fan Flooding.
- ✓ Guidelines posted to the Web, September 1999 [http://www.fema.gov/mit/tsd/FT\\_alfan.htm](http://www.fema.gov/mit/tsd/FT_alfan.htm)

**4. Multiple Hazards Affecting Flood Risks:** The Council recommends that multiple hazards that pose flood risks that can cause loss of life and property be included in digital FIRM products. The Council further recommends that FEMA continue participation in the Open GIS Consortium to provide links to other sites containing hazard data affecting flood risks for retrieval by users.

- ✓ Enhanced digital FIRM Spatial Database will be expandable to include multiple hazards. A digital FIRM Users Guide will be developed to provide users with information on how to add other hazard information.
- ✓ Digital FIRM graphics and database design are being coordinated with HAZUS development team.

**5. Distribution of Data: Archiving, Map Availability, and Accuracy:** The Council recommends that FEMA set up a retrieval system for archived data both in its possession and housed elsewhere, including an index for location of historic FIRMs, LOMCs, and technical back-up data for flood studies.

- ✓ Initiative underway to make LOMCs and technical support data for flood studies available through FEMA's web site.
- ✓ By October 1, 2000, FEMA's Map Service Center (MSC) will have a geo-indexing tool that will enable individuals to punch in property addresses to determine what map panels to order.
- ✓ FEMA's MSC investigating means of scanning maps and making them available on FEMA's web site.



## 6.0 Office of Inspector General Audit of FEMA's Cost Estimation for Implementing the Map Modernization Plan

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The results of FEMA's Office of Inspector General (IG) audit of FEMA's cost estimate for implementing the map modernization plan are presented in a booklet entitled "Audit of FEMA's Cost Estimate for Implementing the Flood Map Modernization Plan," dated September 2000. The objectives of the audit were to determine if FEMA's cost estimate (1) was based on reasonable mapping requirements; (2) included reasonable assumptions and accurate cost estimates and calculations; and (3) incorporated lower-cost alternatives and cost-saving technologies, where feasible. The results of the audit for each of these objectives are summarized below.

(1) Is FEMA's cost estimate based on reasonable mapping requirements?

Results: The IG found that FEMA's map modernization plan meets minimum legislative and regulatory requirements. It also provides for the addition of low-cost features that map users need, incorporates technological advances, and includes a plan for the transition from paper maps to digitized maps. The plan does not include excessive requirements or "gold plating." It does a good job of balancing requirements with users' needs and improving the accuracy and utility of map products.

(2) Does FEMA's cost estimate include reasonable assumptions and accurate cost estimates and calculations?

FEMA's cost estimate for the modernization plan has seven major cost components. The IG audited the four most costly components identified in FEMA's August 1999 report, "Cost Estimate for the Flood Map Modernization Plan": FEMA-Funded Flood Data Updates, Digital Conversion and Map Maintenance, Communities and Tribal Nations Without Maps, and Annual Costs for Ongoing Activities.

The IG found that, in general, FEMA's methodology for estimating the cost of its modernization plan was sound. However, the estimate is unreliable because some assumptions and other factors that will have a major impact on costs are largely unpredictable. The IG recommended that the Associate Director, Mitigation Directorate:

- Update the August 1999 Cost Estimate for the Flood Map Modernization Plan by using FEMA's actual historical cost data wherever possible and, to the extent possible, validate and determine the cost benefit of mapping needs identified by both mapped and unmapped communities.

The Mitigation Directorate stated in its September 25, 2000, response to the draft audit report that it agrees with this recommendation. Because FEMA is in the process of completely redesigning the digital FIRM product, historical cost data for the old digital FIRM product might provide unreliable projections; however, as actual production costs data become available, they will be used in making future adjustments to the cost model. In addition, MNUSS will be used for the FY 2001 procurement cycle. A benefit-cost algorithm for unmapped communities is under development. MNUSS will be enhanced to perform benefit-cost analyses, separately, for mapped and unmapped communities. Depending upon the level of funding for the given fiscal year, the FEMA Regions will conduct comprehensive needs assessments for the top priority communities, in cooperation with the NFIP State coordinating agencies.

- For planning purposes, develop and present estimated costs as a range where there is a high degree of uncertainty, and explain the reasons for the uncertainty and what impact it might have on the overall cost estimate.

Mitigation responded that the estimate is developed primarily for FEMA's budget submission to OMB and presenting the estimate as a range for budget purposes would open it to misinterpretation.

- Work with FEMA's Chief Financial Officer to ensure that FEMA's accounting system captures detailed cost information on flood studies, digital conversion, and other mapping-related costs for use in future revisions to the plan's cost estimates.

Mitigation agreed to refine the estimate yearly and work with the Chief Financial Officer to develop ways to capture the necessary cost information in FEMA's accounting system. FEMA's Monitoring Information on Contracted Studies system (under development) will be of assistance. It is being designed to track contracted studies from initiation to completion.

- (3) Does FEMA's cost estimate incorporate lower-cost alternatives and cost-saving technologies, where feasible?

The audit report concluded that FEMA has taken the first steps toward implementing new cost-saving partnerships and technologies, and has accounted for some potential savings in its estimate of costs to implement the modernization plan. However, FEMA should aggressively pursue cost-saving technologies and partnership and other potentially cost-saving concepts, and should address them more fully in its modernization plan, including estimates of the cost savings that will result. The IG recommended that the Associate Director, Mitigation Directorate:

- Expedite the incorporation of automated hydrology and hydraulic modeling techniques and LIDAR into the mapping process, where feasible.
- Include in the modernization plan the cost impact of partnerships such as CTPs, new mapping techniques such as automated hydrology and hydraulics, and technological advancements, such as LIDAR.

Mitigation agreed with these recommendations. Mitigation is committed to monitoring emerging technologies. Mitigation plans to further open its mapping process to new mapping techniques and technologies by publishing production specifications and standards, which will allow new techniques or technologies to be incorporated into the mapping process. Toward this end, Mitigation recently issued draft product specifications for LIDAR.

Mitigation also pointed out that its August 1999 cost estimate did account for the impact of technology on study costs. A 5% reduction in study costs each year beginning in 2002 and ending in 2005 was factored in, for a maximum 20% reduction.

## 7.0 Progress on Objectives

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### 7.1 Products and Standards Objectives

The following is a discussion of products and standards objectives that are ongoing or completed. In addition to these objectives, FEMA is preparing a comprehensive guidelines and specifications document for flood mapping activities, to include SC activities, MCC activities, coastal studies, scoping activities, and the new digital FIRM.

#### 7.1.1 New Digital FIRM Product

##### Summary of Objective

The digital FIRM product involves converting the existing inventory of manually produced Flood Insurance Rate Maps (FIRMs) to digital format. The new digital product will be able to address maintenance needs as well as restudy needs. The digital FIRM product will be designed to allow for the creation of interactive, multi-hazard digital maps. Linkages will be built into a database to allow users options to access the engineering backup material used to develop the map (e.g., H&H models, flood profiles, floodway data table, Digital Elevation Models [DEMs], and structure-specific data, such as digital elevation certificates and digital photographs of bridges and culverts).

##### Accomplishments through FY 1999

The new digital FIRM product work group was split into eight smaller subgroups that are focused on specific portions of the overall product. Additionally, the digital FIRM work group met with representatives of the HAZUS team to identify areas of commonality. HAZUS is a loss estimation tool developed by FEMA initially for earthquake hazard loss estimation. A flood module is currently being developed. The activities of the eight subgroups are as follows:

- ✓ The digital FIRM graphic specifications subgroup was formed to develop the graphic specifications for the new digital FIRM product, including colors, patterns, lineweights, text fonts, etc. The first 14 prototypes were distributed to Technical Mapping Advisory Council members and other select reviewers for a Phase 1 review on April 30, 1999. Copies of the prototypes were also displayed at the 1999 ASFPM and National Flood conferences.
- ✓ The digital FIRM database design subgroup was formed to develop the database architecture for the items that will be attached to the map graphics. This includes the structure for linking features to each other and to all the underlying engineering and back-up data. The first draft database design was distributed for public review and comment on July 21, 1999, and posted on FEMA's web site on July 28, 1999.

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- ✓ The use policy subgroup was formed to develop a recommended use policy that will help clarify issues for users as they migrate from a paper to a digital environment. A draft use policy is being reviewed by FEMA before its release to outside reviewers.
- ✓ The distribution subgroup was formed to address how the digital product(s) will be distributed. This group is developing a draft distribution plan. Coordination to define the digital FIRM viewing tool was initiated.
- ✓ The metadata specifications subgroup will develop new digital FIRM product metadata specifications once the database design is complete. The digital FIRM database contains many items that will be used in the creation of metadata.
- ✓ The implementation plan subgroup will not be activated until the product design is complete. It is also dependent on funding levels. This group will need to coordinate its efforts with other related Mitigation activities and other Federal agencies.
- ✓ The user application needs subgroup will convene once the first database prototypes have been developed. A wide user base is expected to contribute ideas to this subgroup.
- ✓ The cost quantification subgroup will not be activated until the product design is complete.
- ✓ Prepared document “The Implications of Grayscale & Color FIRMs for FEMA’s Map Modernization Program” in December 1999.

### **FY 2000 Accomplishments**

- ✓ Completed draft digital FIRM graphic specifications in November 2000.
- ✓ Completed legend and border description document entitled “Changes to Legend, Title Block, and Border Information”. The document contains revised and reorganized “Notes to Users” shown on the digital FIRM, enhancing their clarity and usability. The digital FIRM Title Block was standardized.
- ✓ Posted database prototypes and second database design on FEMA’s web site on May 2, 2000.
- ✓ Distributed 760 preliminary map panels using the new digital FIRM graphic specifications and DOQQ base maps (70 digital FIRM panels became effective in FY 2000).
- ✓ Several CTPs began utilizing the new digital FIRM graphic specifications. CTP needs are being considered in the development of the digital FIRM database design specifications.
- ✓ The metadata specifications subgroup merged with the database subgroup. Metadata specifications are being developed in conjunction with the database design specifications.
- ✓ A third draft digital FIRM use policy was developed to address cases where the exact location of the Special Flood Hazard Area is in dispute. A history of the use policy was compiled, seeking review of the proposed policies by FEMA’s Office of General Counsel.
- ✓ A digital FIRM subgroup was formed to specifically address development of the digital FIRM viewing tool to be distributed by the Map Service Center. Initial development planning indicates two separate viewing tools, both CD and web-based, may be needed. Currently researching licensing issues with available software.
- ✓ A digital FIRM subgroup to address multi-hazard mapping is being considered.

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- ✓ Progress on digital FIRM specification development reported at ASFPM, National Flood, and FEMA Engineers' Conferences.

### **Action Plan**

- ✓ Finalize graphic specifications in FY 2001; posting on FEMA Map Modernization digital FIRM Website.
- ✓ Finalize and post digital FIRM standard database specifications on FEMA Map Modernization digital FIRM Website by June 1, 2001.
- ✓ Continue development of the digital FIRM viewing tool to be distributed by the Map Service Center in FY 2001.

### **Deliverables**

The following are under development:

- ✓ "DFIRM Graphic Specifications; Draft; November 2000." The digital FIRM specifications include base map specifications.
- ✓ Digital FIRM database specifications
- ✓ Digital FIRM viewing tool for viewing digital maps in a desk-top environment
- ✓ Guidelines for Use of Digital Products

### **7.1.2 Base Map Specifications**

#### **Summary of Objective**

Base maps cover the entire geographical area of a community and include roads, railroads, streams, and other physical features, as well as corporate limits and section lines. These map features are employed by map users to locate properties and structures relative to floodplains. The accuracy of base maps used in the production of FIRMs is important to the overall precision of FIRMs; therefore, updated minimum standards for base maps will be established for use in the development of FIRMs.

To be able to expend its limited dollars on flood studies, FEMA wants to rely on ongoing efforts of others for the development of base maps. The U.S. Geological Survey (USGS) has a National Digital Orthophoto Partnership program that involves partnering between Federal, State, and local governmental agencies for the production of DOQQs. The purpose of the Base Map Objective is: (1) To establish base map standards for State- or community-supplied mapping that would be acceptable for displaying the flood hazard; and (2) In the absence of State- or community-supplied mapping, to establish, if available, the USGS supplied DOQQ as the default base map.

#### **Accomplishments to Date**

- ✓ Base map options have been established and prioritized. Community data that meet the minimum requirements are the first choice. DOQQs are the default base map.
- ✓ A series of meetings have been held with the USGS to discuss partnering options for the acquisition of DOQQs to support FEMA's digital FIRM mapping needs. These meetings will continue.
- ✓ The base map specifications were finalized and distributed to the FEMA Regional Mitigation Divisions and the Technical Mapping Advisory Council on May 26, 1999.

#### **Action Plan**

- ✓ Base map specifications are being incorporated into the digital FIRM specifications.
- ✓ In FY 2001, FEMA may implement a base map strategy for obtaining base maps and preparing DOQQ Production Request Packages for submission to the National Digital Orthophoto Partnership (NDOP) Review Committee.

### **7.1.3 Advanced Remote Sensing Technologies**

#### **Summary of Objective**

This objective assesses LIDAR, IFSAR, and LIDAR/IFSAR fusion for use in gathering topographic and base map information for FISs. This objective also includes, as appropriate, development of guidelines and specifications for these technologies in FEMA 37, *Guidelines and Specifications for Study Contractors*. As part of the implementation process of these technologies, a training program will be developed and presented to FEMA staff and other organizations as required.

#### **Accomplishments through FY 1999**

##### **LIDAR:**

- ✓ Developed guidelines and specifications; received comments from Federal and State government, academia, and industry experts; received appropriate approvals; and published on FEMA web site. (These are the first such guidelines and specifications in the United States.)
- ✓ Developed additional guideline and specification items while reviewing the performance of four LIDAR vendors at the Lakewood, California, test site.
- ✓ Presented training on and critique of LIDAR performance at conferences and briefings, including conferences of the American Society for Photogrammetry and Remote Sensing, ASFPM, and the FEMA Regional Engineers (REs).
- ✓ Contracted with the Louisiana Oil Spill Coordinator's Office to prepare topographic maps from LIDAR-derived digital elevation models for approximately one quarter of the State using the published LIDAR guidelines and specifications.

##### **IFSAR and LIDAR/IFSAR Fusion:**

- ✓ Contracted with the Jet Propulsion Lab through the Army Topographic Engineering Center to evaluate performance and develop guidelines and specifications for use in FISs.
- ✓ Flew mission over the Red River of the North basin in North Dakota to collect data and evaluate the performance of both IFSAR and LIDAR/IFSAR fusion.

#### **FY 2000 Accomplishments**

- ✓ Prepared FEMA 37 Appendix Draft IFSAR Specifications.
- ✓ LIDAR Guidelines and Specifications continue to serve as a working standard being applied on actual FIS projects.
- ✓ Provided briefing on the FEMA LIDAR standard at the annual conference of the American Society for Photogrammetry and Remote Sensing (ASPRS). ASPRS is developing its own LIDAR standard expected to be used throughout the industry.
- ✓ Included portions of the FEMA LIDAR standard in solicitations to obtain high-resolution bare-earth Triangular Irregular Networks (TINs) and Digital Elevation Models (DEMs) for the North Carolina Cooperating Technical State (CTS) initiative for remapping the entire state.

#### **Action Plan**

##### **LIDAR:**

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- ✓ Continue to participate in newly formed National Digital Elevation Program (NDEP), which has been established primarily for the purpose of sharing and obtaining digital elevation data among Federal, State, local agencies and academia. The goal is for agencies to not duplicate funding efforts, and to establish technical standards for obtaining the data. FEMA is a lead agency in this effort to share and obtain high-resolution digital data, particularly for flood studies.
- ✓ Track status of ASPRS task force efforts to develop LIDAR standards for the industry. Determine the relevance of those standards to FEMA applications.
- ✓ Develop LIDAR costing guidelines for FEMA staff.
- ✓ Present briefings and training as required.

### IFSAR and LIDAR/IFSAR Fusion:

- ✓ Revise Appendix 4 (Aerial Mapping and Surveying) to FEMA 37, *Guidelines and Specifications for Study Contractors*, to address the following new topics: (1) accuracy requirements expressed in terms of the Federal Geographic Data Committee (FGDC) National Standard for Spatial Data Accuracy (NSSDA) of 1998 which replaces the National Map Accuracy Standard (NMAS); (2) network control points, surveyed in accordance with NGS-58 (1997), for FIS network accuracy relative to the National Spatial Reference System (NSRS); and (3) incorporation of ASPRS LIDAR standards with FEMA's specialized LIDAR and/or IFSAR standards.
- ✓ Develop costing guidelines for FEMA staff, noting that the only commercial IFSAR vendor does not provide unrestricted data rights but sells IFSAR data, at reduced costs, to multiple agencies.
- ✓ Present training and briefings for FEMA staff on an as-needed basis.

### **Deliverables**

- ✓ Revised Appendix 4 to FEMA 37
- ✓ PowerPoint training presentation regarding the use of LIDAR and IFSAR for FIS requirements, and relevant costing guidelines.



### **7.1.4 Automated Hydrologic and Hydraulic Modeling**

#### **Summary of Objective**

This objective is to assess the available technologies to automate the different aspects of floodplain analysis, including hydrology, hydraulics, and mapping. The available technologies are tools that work within a Geographic Information System (GIS) using software applications and database structures to perform any or all of the steps in floodplain analysis.

#### **Accomplishments through FY 1999**

- ✓ Initiated work group in May 1999.
- ✓ Held several work group meetings.
- ✓ Developed a detailed list of well-known automation tools.
- ✓ Discussed issues, including whether the “tools” are computer models and, therefore, subject to FEMA’s regulations on using computer models for flood hazard mapping in the NFIP; developed draft procedural memo to clarify these issues.
- ✓ Held preliminary discussions on development of Internet-based educational package.

#### **FY 2000 Accomplishments**

- ✓ Developed draft web site for the objective, which includes information on approximately 20 automated H&H tools; FEMA’s policy statement for using the tools in the NFIP; and a tutorial program that discusses automated H&H methods and technical issues.

#### **Action Plan**

- ✓ Finalize internal policy memorandum to explain the use policy for automated H&H tools.
- ✓ Finalize Automated H&H web site and release to the public.

#### **Deliverables**

- ✓ Final Web Site: The web site will include an assessment of the available technologies that are being used to automate the hydrology, hydraulics, and/or mapping steps in the Flood Insurance Study process. A detailed explanation of each of the tools, including the capabilities, availability, GIS platform, limitations, and other information will be included on the site. The web site is geared to provide information on this technology to FEMA’s Regional Engineers, Cooperating Technical Partners, Study Contractors, Map Coordination Contractors, and the public and private sector engineering communities that are interested in using automated techniques to enhance the flood hazard mapping process. (FY 2001)
- ✓ Automated H&H Tutorial Program: The tutorial program will be included on the automated H&H web site and will discuss the details of using these techniques for Flood Insurance Studies. It will focus on data requirements, how to obtain data, and the detailed steps to follow to perform various automated H&H modeling tasks. The tutorial will not support one GIS platform or automation tool over another, but instead will focus on the general steps of the process. (FY 2001)

### **7.1.5 Zone A Areas**

#### **Summary of Objective**

It is estimated that approximately 50 to 70% of Special Flood Hazard Areas on FEMA flood maps have the approximate Zone A designation. Zone A areas create unique problems for communities and private landowners because of the lack of detailed information. As FEMA implements its modernization plan to upgrade its flood map inventory, Zone A areas will be addressed as part of the upgrade. This objective will develop guidance, tools, and processes to ensure, as the inventory is upgraded, that:

- Zone A areas are converted to detailed studies where the level of existing and/or proposed development warrants doing so;
- Zone A areas are more accurately delineated where detailed studies are not warranted; and
- Erroneous Zone A areas are removed.

#### **Accomplishments through 1999**

- ✓ Established the Zone A Work Group.
- ✓ Developed a work plan.

#### **FY 2000 Accomplishments**

- ✓ Prepared an executive summary of a recommendation report outlining strategies for addressing Zone A areas. The executive summary is being reviewed internally by FEMA.

#### **Action Plan**

- ✓ Develop guidance for evaluating Zone A areas at the scoping phase of flood studies, including determining appropriate levels of analysis.
- ✓ Develop recommendations and related guidance documents for improving Zone A processing.
- ✓ Assess automation technologies and analysis methodologies for revising/re-delineating Zone A areas.

#### **Deliverables**

- ✓ Complete the recommendation report addressing items listed under the Action Plan.

### **7.1.6 Revised Guidelines for Determining Flood Hazards on Alluvial Fans**

#### **Summary of Objective**

Multiple variables can affect alluvial fans and flooding on alluvial fans, such as climate, fan history, vegetation, and land use. FEMA has adopted an approach to identify and map flood hazards on alluvial fans that accounts for site-specific conditions.

The approach, detailed in the *Guidelines for Determining Flood Hazards on Alluvial Fans* (February 2000), addresses recommendations in a 1996 report by the National Research Council's (NRC's) Committee on Alluvial Fan Flooding. The committee was created by the NRC, upon FEMA's request for assistance in dealing with alluvial fan flooding issues, to study how to improve the way FEMA addresses alluvial fan flood hazards in the context of the NFIP. The Guidelines provide guidance for the identification and mapping of flood hazards occurring on alluvial fans, including active and inactive

alluvial fan flooding. The guidelines detail a three-stage approach for alluvial fan flooding identification and mapping.

### Accomplishments through FY 1999

- ✓ The revised *Guidelines for Determining Flood Hazards on Alluvial Fans* has been completed and posted on FEMA's Technical Services Division Web page for implementation.
- ✓ In addition to holding meetings with the work group and various constituencies over the last 2 years, FEMA widely distributed draft version(s) of the revised Guidelines for peer review. This peer review included people from academia, Federal, State, regional, and local governments, and the private sector. The draft was distributed to staff of FEMA Headquarters (HQ) and Regional Offices (ROs), members of the Technical Mapping Advisory Council, members of the NRC Committee on Alluvial Fan Flooding, ASFPM representatives, various local communities, regional flood control districts, State agencies in the western United States that have experience mapping alluvial flood hazards and regulating land use on the fans, and private consultants experienced with evaluating fan hazards. The wealth of knowledge provided through comments in the peer review included those with experience in hydrologic and hydraulic engineering, geomorphology, soil science, and floodplain management. Over the last 2+ years, the proposed approach, as well as the Guidelines, have been presented at a number of conferences in the western United States, including conferences in California, Nevada, Arizona, and Oregon.

### Action Plan

- ✓ Continue implementation of the Guidelines for MCCs, SCs, CTPs, and map revision requesters such as local, state, and federal agencies, and the private sector.
- ✓ Continue outreach and presentation of the Guidelines to facilitate implementation.

### Deliverables

- ✓ Revised *Guidelines for Determining Flood Hazards on Alluvial Fans* (FEMA 2000).
- ✓ Web page with Guidelines available, as well as related information on alluvial fan flood hazards, at [http://www.fema.gov/mit/tsd/FT\\_alfan.htm](http://www.fema.gov/mit/tsd/FT_alfan.htm).

This objective is now considered complete and has been incorporated into standard operating procedures.

### 7.1.7 NFIRA Coastal Erosion Studies

#### Summary of Objective

This objective provides for the completion of the evaluation of erosion hazards mandated by section 577 of the National Flood Insurance Reform Act of 1994 (NFIRA). The study evaluates the economic impact of erosion and erosion mapping on communities and on the NFIP. More specifically, the purpose of the study is to determine whether erosion hazard areas should be mapped for risk delineation, floodplain management, and the establishment of flood insurance risk classifications that more directly reflect the effects on the NFIP premium rates of long-term erosion.

#### Accomplishments through FY 1999

FEMA conducted the study in two phases.

- ✓ In the first phase, erosion hazard areas were mapped for 27 coastal counties in 18 States. This portion of the study was conducted by State Coastal Zone Management organizations, or their designees, and was completed in December 1997.

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- ✓ The second phase required three principal tasks, all conducted by the H. John Heinz Center. The first task, which was completed May 1999, was an inventory of structures located within the mapped erosion hazard areas. The second task is the economic impact analysis of erosion on coastal communities and on the NFIP. The third task is to conduct an analysis to determine whether it is cost-beneficial to map erosion hazard areas through the NFIP.

### **FY 2000 Accomplishments**

- ✓ The Heinz Center completed its report, entitled "Evaluation of Erosion Hazards," in April 2000.

### **Action Plan**

- ✓ Develop a strategic plan for implementing a coastal erosion hazard mapping program, as directed by Congress.

## **7.1.8 Recommendations for Using Future Conditions Hydrology for the NFIP**

### **Summary of Objective**

Flood risk information presented on the flood maps is based on the existing conditions of the floodplain and watershed. After publication of the maps, however, flood hazards may change significantly in areas experiencing urban growth or changes in physical conditions caused by such geologic processes as subsidence and erosion. When the mapping of flood hazards was initiated under the NFIP, the intent was to reassess each community's flood hazards periodically and, if needed, revise the maps. However, budgetary constraints prevent initiating actions to update flood maps with sufficient frequency to reflect the changing flood hazards brought about by natural and man-made changes. Although the existing conditions floodplain will continue to be mapped for flood insurance purposes, future conditions hydrology can also be mapped so that communities can use this information for floodplain management.

### **Accomplishments through FY 1999**

- ✓ Held a series of meetings over the previous 12-18 months.
- ✓ Completed draft reports, including a sample FIS report and FIRM that included future hydrology considerations.
- ✓ Distributed draft reports for review and comment to FEMA HQ and Regional Mitigation staff, the Federal Insurance Administration, the Office of General Counsel, the Technical Mapping Advisory Council, and other interested constituencies such as local communities that currently utilize future conditions.
- ✓ Presented the proposed approach, as well as the preliminary recommendations of the report, at a number of conferences in the United States.

### **FY 2000 Accomplishments**

- ✓ Completed report, including a sample FIS report and FIRM that included future hydrology considerations.
- ✓ Presented the proposed approach and recommendations of the report at a number of conferences in the United States.
- ✓ Completed Technical Services Division Web page for the future conditions report.
- ✓ Drafted proposed rule for implementation of report recommendations.

### Action Plan

- ✓ Complete legislation package for implementation of report recommendations

### Deliverables

- ✓ Final report *Recommendations for Using Future Conditions Hydrology for the NFIP*.
- ✓ Technical Services Division Web page.

### 7.1.9 Riverine Erosion Hazard Area Feasibility Study

#### Summary of Objective

This objective is to conduct the Riverine Erosion Hazard Area (REHA) Mapping Feasibility Study in response to Congress enacting NFIRA into law on September 23, 1994. Section 577 of NFIRA requires that FEMA submit a report to Congress that evaluates the economic impact of erosion and erosion mapping on the NFIP (for coastal and Great Lakes) and determine if it is technologically feasible to map REHAs. Technological feasibility is defined as the existence of methodologies that are scientifically sound and implementable under the NFIP. Scientifically sound means that the methodologies are based on physical or statistical principles and are supported by the scientific community. Implementable means that the approaches can be applied by FEMA as part of a nationwide program under the NFIP and for an acceptable cost.

The objectives of the study were to:

- ✓ Define riverine erosion processes;
- ✓ Discuss geomorphic and engineering methods that can be used to map REHAs;
- ✓ Evaluate the methods of predicting and modeling REHAs that have been applied in selected case studies within the United States;
- ✓ Evaluate the approximate costs to study and map REHAs;
- ✓ Discuss programmatic elements associated with mapping and regulating REHAs; and
- ✓ Determine the technological feasibility of mapping REHAs.

#### Accomplishments through FY 1999

- ✓ Completed an in-depth search and technical evaluation of existing methodologies used to predict and map REHAs.
- ✓ Prepared a final draft report.
- ✓ Over the previous 12+ months, developed and distributed draft reports to the Technical Mapping Advisory Council, FEMA staff, and the Project Working Group for review and comment. The Project Work Group is an external group of technical advisers with expertise in assessing and managing riverine erosion hazards and consists of individuals from throughout the United States representing Federal, State, regional, and local government; academia; and the private sector.
- ✓ Over the previous 2+ years, presented the proposed approach, as well as the preliminary results of the study, at a number of conferences in the United States.

### FY 2000 Accomplishments

- ✓ Completed full report and executive summary *Riverine Erosion Hazard Areas Mapping Feasibility Study* (September 1999).
- ✓ Presented the report findings at a number of conferences in the United States.
- ✓ Submitted final report to Congress.

### Deliverables

- ✓ Final report to Congress.
- ✓ FEMA Technical Services Division web site.

This objective is considered complete; no changes to standard operating procedures are required.

## 7.2 Process Objectives

### 7.2.1 Mapping Needs Assessment

The following process objectives are ongoing or completed. In addition, FEMA plans (in FY 2001) to develop a “best practices initiative” for coordinating the development of updated maps with all program stakeholders, such as community officials, the public, lenders, the insurance industry, and the media.

### Summary of Objective

To develop map update priorities and expend the flood mapping budget in the most cost-beneficial manner, a complete, accurate assessment of flood mapping needs is essential. The Mapping Needs Assessment Process and the Mapping Needs Update Support System (MNUSS) hold the most promise to serve as the primary tools used by FEMA to document and store all map update needs, nationally, and to rank and prioritize communities for funding updates to the flood maps. The Mapping Needs Assessment Process primarily relies on identified needs collected from local officials, State NFIP coordinators, and CTPs that are documented in MNUSS. The ranking and prioritization list developed by MNUSS will then be used in conjunction with the fiscal year budget to determine which map updates to initiate in that fiscal year.

### Accomplishments through FY 1999

- ✓ Completed the first 5-Year cycle by contacting approximately 17,500 communities participating in the NFIP (approximately 34% responded).
- ✓ Identified approximately 8,000 individual flood data update and map maintenance needs for community ranking purposes.
- ✓ Developed an approach to consolidate and prioritize communities based on identified mapping needs in MNUSS.

### FY 2000 Accomplishments

- ✓ Began the second 5-Year cycle and continued to receive mapping needs data from various sources, e.g., local officials, which increased the response rate to approximately 37%.
- ✓ Reviewed previous Biennial Reports and entered needs (primarily maintenance needs) into MNUSS.

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- ✓ Identified an additional 3,800 mapping needs to bring the total to over 11,800 individual flood data update and map maintenance needs for community ranking purposes and entered them into MNUSS.
- ✓ Developed a correlation between NFIP Community Identification Number (CID) and Federal Information Processing System (FIPS) Code for over 20,000 communities.
- ✓ Obtained from the U.S. Census Bureau and downloaded population and land area into MNUSS for approximately 17,500 communities.
- ✓ Conducted a tutorial/training on entering needs into MNUSS for six State NFIP coordinators and one CTP.
- ✓ Developed a worksheet and instructions for inputting needs into MNUSS and made it available through the web-based version of MNUSS.
- ✓ Completed the programming and testing of the enhanced version of MNUSS: to capture additional data fields, to add the capability to consolidate and rank all mapping needs (flood data update, map maintenance, and/or digital conversion) for a community, to make screens more user-friendly, to include revised unit costs.
- ✓ Performed and documented a comparison between HAZUS and MNUSS.
- ✓ Developed design screens for use in MNUSS for multi-jurisdictional groupings, i.e. the ability to create groups of communities that can be comparatively ranked in the same manner as individual communities to account for cost savings realized when doing county- or watershed-wide studies.
- ✓ Began an evaluation of an existing list of over 5,500 unmapped communities to confirm whether a flood risk exists in each community and to categorize the communities according to action needed to be taken to provide maps and necessary funding.

### Action Plan

- ✓ Develop a process for prioritizing unmapped communities.
- ✓ Program MNUSS to include unmapped communities and multi-jurisdictional groupings.
- ✓ Integrate the mapping needs collection process with the Biennial Report.
- ✓ Complete detailed, objective assessments of community mapping needs so MNUSS can be further populated and implemented as a decision-making tool.
- ✓ As part of the CTP initiative, pursue assessments of community mapping needs as a partnership activity with State and regional agencies; the resultant data will be used to populate the enhanced MNUSS. To assist FEMA's partners in completing such assessments, FEMA has completed guidance on conducting objective assessments of community flood mapping needs.

### 7.2.2 Scoping of Flood Insurance Studies

#### Summary of Objective

The purpose of this objective is to develop guidance and identify tools to be used by FEMA's study managers during the scoping phase of the flood map development and production process. This phase involves identifying the community's mapping needs (restudy and map maintenance), determining study methodologies, identifying the available data and their source and format, determining which optional data layers will be included in the digital FIRM product, and collecting the necessary data. It also

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includes assigning tasks to the various entities involved in the flood map development/production process (SCs, MCCs, CTPs, and Federal, state, and other agencies), establishing schedules for reviews and deliverables, assigning budgets, and identifying deliverable requirements and information management and reporting needs.

### **Accomplishments to Date**

- ✓ Initiated work group in September 1999.
- ✓ Developed list of key issues to be addressed.



### Action Plan

- ✓ Develop general guidance, listing of available FEMA and contractor resources, and management tools to prepare for and conduct community-contractor coordination meetings.
- ✓ Develop a process for selecting digital FIRM options during the scoping phase.
- ✓ Develop specifications for the standard deliverables that typically are identified in the scoping process and production process.
- ✓ Develop guidance from the Mapping Needs Assessment process for preparing pre-Time-and-Cost scoping packages and other products needed.
- ✓ Develop guidance for conducting community-contractor coordination meetings under the new optimized study process.
- ✓ Recommend enhancements to information management tools, such as MNUSS, MICS, and the Community Information System (CIS), as needed. Develop other supplementary scoping and scheduling tools.

### Deliverables

- ✓ Report with recommendations for implementing a comprehensive scoping process.

### 7.2.3 Optimized Study Process

#### Summary of Objective

The purpose of this objective is to optimize the FIS process so that each community's FIRM can be created, revised, distributed, and stored more efficiently and effectively. To accomplish this objective, each task from FIS initiation to FIS publication to FIS storage was described. Options for the accomplishment of each task were identified, and recommendations were provided. The specialized skills and abilities from both the public and private sectors that are necessary to accomplish each FIS task can be utilized, resulting in the highest-quality FIS and FIRM possible.

#### Accomplishments through FY 1999

A report has been delivered with the following recommendations:

- ✓ The work group recommends that the responsibilities of the SC, MCC, ROs, FEMA HQ, State, and communities (including CTPs) be flexible to maximize the particular expertise and capability of each team member. The responsibilities of each should be detailed in the Task Order Statement of Work (SOW) and CTP agreement (as applicable). The MICS database will be enhanced to assist the RO in producing the SOWs and community agreements for each FIS.
- ✓ In addition, the work group recommends that an assigned FEMA RE, assisted by an FIS management team, manage all studies throughout their life cycle. A HQ management work group will need to be created to address staffing and resources for management oversight and reporting of studies for the entire national flood mapping program.
- ✓ The work group recommends implementing the optimized study process, which will reduce the average FIS processing time by 60%. This projected time reduction was realized through parallel tasking of restudy assignments, early and more appropriately timed QA/QC reviews, and increased coordination between the ROs, HQ, the SCs, the MCCs, communities, and States. The processing time could be reduced by initiating the 90-day Appeal Period with the draft FIS submission and by making the 6-month Compliance Period independent of the FIRM effective date.

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- ✓ To streamline the SC contracting phase of the FIS process, the work group recommends multi-year Indefinite Delivery-Indefinite Quantity (IDIQ) Task Order Contracts for SCs. HQ should award the contracts, and the ROs should write the Task Orders. The ROs will also write the SOWs and continue to monitor and administer the SC work. With other phases of administration, the ROs may be assisted by members of the FIS management team, as needed. The work group also recommends, where cost effective, that separate aerial mapping contracts be available to each RO.
- ✓ The work group recommends implementing a parallel study process, wherein the various entities involved in the mapping process complete work concurrently.
- ✓ The work group recommends developing procedures for scoping FISs. These have now been developed.

### Action Plan

A suggested implementation plan and schedule for each recommendation has been included in the final report. The following recommendations from the final report are being pursued in FY 2000:

- ✓ Implement 5-Year IDIQ contracts for SCs beginning in FY 2001 for the FIS acquisition process (ongoing).
- ✓ Combine FIS, MCC, and SC Guidelines and Specifications into one document that can be readily amended, as necessary (deferred until more progress is made in this objective), as discussed above.

### Deliverables

- ✓ Final report was completed on May 21, 1999.

This objective is considered complete and has been incorporated into standard operating procedures.

### 7.2.4 Cooperating Technical Partners

#### Summary of Objective

This objective is to develop and implement the CTP initiative whereby partnerships are formed with communities, states, and/or regional agencies to fully integrate them into FEMA's flood hazard mapping process. FEMA will maintain its national standards for NFIP mapping while building on local, state, and regional mapping knowledge and capabilities. This collaboration will make more resources available for flood hazard data collection and mapping efforts nationwide.

#### Accomplishments through FY 1999

- ✓ Completed the conceptual design of the initiative and developed detailed guidance.
- ✓ Developed a *Federal Register* notice regarding the CTP initiative. Publication anticipated in September 1999.
- ✓ Designated pilot CTPs for FY 1999. A total of 30 CTP agreements nationwide are anticipated to be in place by September 30, 1999.
- ✓ Completed the CTP Memorandum of Agreement template.
- ✓ Developed template agreements for nine specific types of mapping activities.
- ✓ Developed the CTP component of the FEMA Flood Hazard Mapping web site.

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- ✓ Conducted outreach activities on the CTP initiative.

### **FY 2000 Accomplishments**

- ✓ A total of 62 CTP agreements nationwide were implemented by September 30, 2000.
- ✓ Signed a CTP Agreement with the State of North Carolina, which also included more than 20 other Federal and local partners and initiated a 5-year, \$60 million program to develop updated flood data and seamless digital FIRM coverage Statewide.
- ✓ Finalized detailed program guidance and made it available through the FEMA Flood Hazard Mapping web site.
- ✓ Developed a template for the CTP Memorandum of Agreement and made it available through the web page.
- ✓ Refined the template agreements for nine specific types of mapping activities and made them available through the web page.
- ✓ Developed a training course and delivered 2 offerings at the Emergency Management Institute in FY 2000.
- ✓ Began expanding the CTP component of the FEMA Flood Hazard Mapping web site.
- ✓ Began development of a database to manage CTP-related information nationwide that will be available to all FEMA offices through a password-protected extranet site. The database will also link to the web page to provide real-time information on each of the CTP participants that will be viewed by the public.
- ✓ Developed a draft guidance document for Regional Engineers to assist them in implementing the CTP.
- ✓ Revised the one-pager information sheet on the CTP and put it in a downloadable format on the web page.
- ✓ In order to better reflect the varied entities participating in the initiative, the name was officially changed to *Cooperating Technical Partners (CTP)* and will be effective for FY 2001 and beyond.

### **Action Plan**

The following activities are planned for FY 2001:

- ✓ Develop more comprehensive eligibility and evaluation criteria for CTP mapping activities.
- ✓ Establish incentives for CTP participation through the NFIP's Community Rating System (CRS).
- ✓ Enhance web site information on CTPs.
- ✓ Develop a pilot project for CTP review of Hydraulic and Hydrologic information related to issuance of Letters of Map Correction.
- ✓ Enter into additional CTP agreements with at least 15 new partners.
- ✓ Coordinate the update of MICS software enhancements to incorporate Cooperating Technical Partner (CTP) elements.

**7.2.5 Monitoring Information on Contracted Studies**

**Summary of Objective**

As the REs' workload continues to increase, automating portions of the SC monitoring process is necessary to maintain the quality of the work. Although the CIS provides part of the required information, the CIS is community-based and does not contain the project management or accounting tools to effectively automate the contracted study process.

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The Monitoring Information on Contracted Studies (MICS) system is designed to complement the CIS by tracking contracted studies from initiation to completion. The MICS system is a study-based system designed for use by REs and SCs. Specifically, MICS is designed to 1) include information on SC selection and contract awards, 2) track budgets in both hourly and dollar amounts, 3) record details of monthly SC contacts and regulatory visits, 4) include Special Problem Reports, and 5) provide SC-specific information.

### **Accomplishments through FY 1999**

- ✓ Completed a Beta-version of the MICS system. The system has been installed at FEMA HQ, and internal testing of the software has been nearly completed. The system will be ready for external testing by REs and SCs shortly.
- ✓ Currently revising the User's Manual.

### **FY 2000 Accomplishments**

- ✓ Due to the loss of the FEMA contractor that developed the MICS software, testing and maintenance of the system ceased.

### **Action Plan**

Future activities will focus on completing the Beta-testing of the MICS system and getting a final version on-line. Specific tasks to be conducted in the future will include the following:

- ✓ Complete internal and external Beta-testing and incorporate comments.
- ✓ Complete the revisions to the User's Manual.
- ✓ Enhance the MICS system with additional features, such as additional alert screens, advanced invoicing and accounting functions, e-mail functions, CIS interface, and incorporation of CTP elements.
- ✓ Develop a long-term maintenance plan.
- ✓ Complete the source code and documentation.
- ✓ Implement MICS at Regions and with SCs.
- ✓ Pursue enhancements to the MICS software to track information on the CTP initiative.

### **7.2.6 LOMA 2000**

#### **Summary of Objective**

LOMA2000 is a software application developed to automate the MT-1 Letter of Map Change (LOMC) products. The software generates and tracks Letters of Map Amendment (LOMAs), Letters of Map Revision - based on Fill (LOMR-Fs), conditional LOMAs (CLOMAs), and conditional LOMR-Fs (CLOMR-Fs). This software has increased processing efficiencies, and a future version will be Web-based, making the data and the documents available over the Internet.

#### **Accomplishments through FY 1999**

- ✓ Manual version of LOMA 2000 documents completed and operational March 1999.
- ✓ Programming of automated version of LOMA 2000 (Version 1.0) completed, and the first automated LOMA issued August 1999. Version 1.0 will generate 70% of the total FEMA production of LOMAs and LOMR-Fs.

#### **FY 2000 Accomplishments**

- ✓ Version 1.2 of LOMA2000 was distributed to the Mapping Coordination Contractors (MCCs) in February 2000. This version gave the MCCs the ability to generate documents for MT-1 LOMC requests having multiple structures or properties.
- ✓ Version 1.3 of LOMA2000 was distributed to the MCCs in March 2000. This version fixed several problems and improved the method to add data for large multiple property requests.
- ✓ Version 1.3 stores applicable data for all MT-1 LOMC cases.
- ✓ Version 1.3 is used by all three MCCs to generate the following MT-1 LOMC documents:
  - 100% of the Acknowledgement of Request letters,
  - Approximately 98% of the Additional Data Request letters, and
  - Approximately 95% of the Determination documents and Comment documents.
- ✓ Implementation of the LOMA2000 application resulted in a labor savings in Fiscal Year 2000 of approximately 1.6 hours per MT-1 LOMC case processed. This represents a savings of approximately 970 staff hours per month.

### Action Plan (FY 2001)

- ✓ Version 1.3.3 of LOMA2000 is scheduled for distribution in March 2001. This version will be released with complete documentation, including a design manual and a users guide.
- ✓ Construction of Version 2.0 of LOMA2000 (MT-1 LOMCWriter) is scheduled to begin in the spring of 2001. LOMCWriter will be a Web-based application using a Structured Query Language (SQL) database engine based on ANSI SQL coding standards. This version will allow a wide range of users to access the data contained in the LOMA2000 database.

### 7.2.7 Improved LOMR Process

#### Summary of Objective

To address this map modernization objective, the work group is developing new Letter of Map Revision (LOMR) and conditional LOMR (CLOMR) products. Currently, these products are lengthy, complex letters. They require recipients to search for the information most important to them, which is, most typically, how the LOMR revises the map or, in the case of a CLOMR, how the project will revise the map if the project is built as proposed. In addition, preparing the letter is an inefficient process because standard information must be incorporated and reviewed for each letter. Further, the standard information is sometimes presented inconsistently. This objective is to improve the existing LOMR and CLOMR process and products by developing a template cover letter and technical, regulatory, and general information enclosures that succinctly describe map changes and community responsibilities as a result of LOMRs and CLOMRs.

#### Accomplishments through FY 1999

- ✓ The work group has prepared draft examples of the cover letter and standardized the technical, regulatory, and general information enclosures. The cover letter states the general impact of the LOMR or CLOMR; thus, the information that is most important to the reader is immediately accessible. The cover letter also lists several points of contact for further questions regarding the LOMR or CLOMR process. The following technical, regulatory, and general information enclosures are included as part of the LOMR or CLOMR product, as applicable:
  - Annotated portions of the Flood Insurance Study, such as Floodway Data Tables, Profiles, Summary of Discharges Table, etc.
  - Annotated portions of the Flood Insurance Rate Map, Flood Boundary and Floodway Map, or Flood Hazard Boundary Map.
  - A table showing the changes in Base Flood Elevations.
  - Summary of *Federal Register* and newspaper notices publicizing the flood hazard changes.
  - Comparison of the flood hazards as determined by the modeling used for the effective map, the modeling of the conditions existing before the project, and the modeling of conditions after construction of the project.
  - Regulatory authority for making the map revision.
  - Additional information and reminders.

#### FY 2000 Accomplishments

- ✓ The work group has prepared a LOMR variable document and a CLOMR variable document. These documents list all of the standardized wording available for a LOMR determination document

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or a CLOMR comment document. Standardizing the wording will ensure consistency and will simplify the automation of the LOMR and CLOMR documents.

- ✓ The work group has reviewed all of the comments received on the initial draft of the LOMR determination documents. These comments will be incorporated into a final draft of the documents and submitted for FEMA review.

### **Action Plan (FY 2001)**

- ✓ Incorporate comments received on the LOMR and CLOMR documents and submit the final draft documents to FEMA personnel for review (February 2001).
- ✓ Incorporate FEMA comments and finalize the documents for use by all of the Flood Map Production Coordination Contractors.
- ✓ Use the new documents for 3 months to obtain additional feedback from the users of the documents. All comments and suggestions will be discussed and, if appropriate, incorporated into the LOMR and CLOMR templates. The finalized templates will be used to begin defining the requirements for the automated LOMCWriter system.
- ✓ The work group plans to consider ways to exploit computer technology to automate the engineering review and letter-preparation processes. For instance, a database system could be used throughout the process to provide an up-to-date “case history” and to minimize the steps necessary to prepare additional data request letters and draft the LOMR or CLOMR documents. Using the database, engineers would have immediate access to the pertinent information about the case, and the information could be accessed by personnel staffing FEMA's Map Assistance Center to field questions regarding the status of requests. A web-enabled system would allow FEMA personnel to access the database information via the Internet. Ultimately, the LOMR and CLOMR documents will be automatically generated from the data stored in the database.

Automation of the LOMR and CLOMR processes will allow the engineer to concentrate more fully on reviewing the technical aspects of the revision. It will also allow easy data archival and retrieval for responding to future requests. By simplifying and automating the document format, and automating aspects of the review process, FEMA will enhance customer service and satisfaction, ensure a more consistent product, and reduce their overall costs to complete these products.

### **Deliverables**

- ✓ A form-driven document that will simplify and standardize the current LOMR and CLOMR process. The documents will mirror the efforts and appearance of the LOMA2000 product.

### **7.2.8 Post-Flood Hazard Verification**

#### **Summary of Objective**

Flooding events provide a valuable opportunity to evaluate the mapped flood hazards versus what actually happened. This objective is to develop a standard procedure for verifying the accuracy of the FIRM and Flood Insurance Study (FIS) for flooded communities declared disaster areas by the president and, if necessary, revising the FIS and FIRM. Providing such up-to-date flood hazard information will be vital to communities' reconstruction efforts after an event.

#### **Accomplishments through FY 1999**

- ✓ Presentation on objective at the Engineers Conference in October 1998.
- ✓ Initial meeting of work group members on November 30, 1998.



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- ✓ Initial subgroup meetings held and completion of subgroup outlines in February 1999.
- ✓ Objective placed on hold to allocate resources to other map modernization objectives in March 1999.

### **FY 2000 Accomplishments**

- ✓ PFHV initiatives in New Jersey, New York, and North Carolina began in September 1999 and were all completed by July 2000. They consisted of GIS support, collection of community data, high water mark data, flood frequency analysis, and ranking the impacted communities for future restudies.
- ✓ Created a PFHV website ([floodmaps.net/floodrecoverydata](http://floodmaps.net/floodrecoverydata)). Includes PFHV procedure, and other resources, such as instructions on how such efforts can be funded and historical examples of PFHV efforts.
- ✓ Created document detailing PFHV procedure that can be applied nationally to a Presidentially declared disaster. Posted document on the PFHV website.

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- ✓ Created statement-of-work templates and posted them on floodmaps.net website. These will aid the FEMA Regional Offices in assembling and mobilizing staff and contractors in a disaster environment before perishable data, such as high water marks, are no longer available. Also worked with the Federal Coordinator for Meteorological Services and Supporting Research to incorporate the templates mentioned above into the National Post Storm Data Acquisition Plan.
- ✓ FEMA was given authorization to spend 15 million in DRF money to prepare updated FIRMs in states and communities impacted by flooding disasters.

### **Action Plan**

- ✓ January 2001 – December 2001: Continue to update the floodmaps.net site with historical data and new statement-of-work templates, as they become available.
- ✓ January 2001 – December 2001: Evaluate and incorporate the results of each PFHV effort into MNUSS and MICS, as appropriate.
- ✓ April 2001 – Prepare a memo that outlines more specifically what the 15 million in DRF money mentioned above can be used for.

### **Deliverables**

- ✓ A database-driven, statement-of-work report generator, if warranted.

## **7.3 Other Program Improvement Objectives**

### **7.3.1 LOMA and LOMR-F Delegation**

#### **Summary of Objective**

This objective has been created to investigate and address the issues and concerns regarding the delegation of the LOMA and LOMR-F authority to the community and private sector, particularly licensed surveyors and professional engineers.

#### **Accomplishments to Date**

- ✓ A meeting was held December 9, 1998, between FEMA and certain LOMA and LOMR-F user constituents from the States and professional organizations.
- ✓ A summary report was prepared and distributed on August 17, 1999, with a copy of the meeting minutes, to the FEMA Regional Mitigation Divisions, the December 9<sup>th</sup> meeting participants, the ASFPM Mapping Committee, and the Technical Mapping Advisory Council.

### Action Plan

- ✓ In FY 2000, the Technical Services Division will continue to examine all aspects of the current LOMA and LOMR-F process to determine what can be modified to simplify the process. Both the public and private sector will be involved in that process.

FEMA staff are coordinating with their Office of General Counsel to determine the statutory and regulatory implications of this activity.

### **7.3.2 Map Modernization Outreach**

#### Summary of Objective

This objective is to develop and implement a marketing plan for map modernization. It seeks to publicize the map modernization plan to facilitate progress on all the other objectives of the plan. Providing information about the plan will allow many disparate parties to work together to further the goals of map modernization.

#### Accomplishments through FY 1999

- ✓ FEMA created two publications in May 1998 that explain the plan and how it complements Project Impact: *Modernizing the Flood Hazard Mapping Program* and *Modernizing the Flood Hazard Mapping Program: Community Involvement and Ownership*. FEMA has distributed these publications at numerous conferences and meetings and in response to inquiries about the map modernization plan.
- ✓ FEMA has published a bimonthly bulletin tracking the progress on map modernization, *Work in Progress*. Each issue highlights several of the objectives and discusses the progress to date. *Work In Progress* has evolved to be an exclusively Web-based publication.
- ✓ FEMA has provided information about mapping modernization at many conferences and other meetings.
- ✓ FEMA has written numerous articles about the map modernization plan for publication in trade magazines and newsletters.

#### FY 2000 Accomplishments

- ✓ FEMA updated the Map Modernization portion of FEMA's web site.  
[http://www.fema.gov/mit/tsd/MM\\_main.htm](http://www.fema.gov/mit/tsd/MM_main.htm)

### Action Plan

- ✓ FEMA will continue to present information on the progress of individual objectives of map modernization as well as progress on the plan as a whole at upcoming conferences and meetings with stakeholders.

### **7.3.3 Regulations and Laws**

#### Summary of Objective

As plans and specifications are finalized for the other objectives, this work group will evaluate the regulatory impacts of the map modernization plan. The work group, which uses a more holistic approach than the work group for the regulatory reform for 44 CFR 65.5, will review regulatory impacts of the overall map modernization effort as well as specific objectives. The work group will present its findings to FEMA and Congressional representatives.

### Accomplishments through FY 1999

- ✓ Due to the dynamic nature of the scope of the map modernization plan and because plans and specifications were still being finalized for other objectives, the work on this objective was in its early stages.

### FY 2000 Accomplishments

- ✓ A report titled "Evaluation of NFIP Regulations and Laws for Potential Impact on Implementation of the Map Modernization Plan," dated March 2000, was developed. The report presents findings and makes recommendations regarding the portions of the NFIP regulations and legislation that would impact implementation of the Map Modernization Plan.

This objective is considered complete. No changes are required to standard operating procedures.

### 7.3.4 National Geodetic Survey Partnership

#### Summary of Objective

Develop a formal partnership between FEMA and the National Geodetic Survey (NGS) to improve coordination and cooperation. The NGS, a part of the National Oceanic and Atmospheric Administration, maintains a network of more than 750,000 precisely located monumented reference points in the United States. The NGS's accurate national reference network and Global Positioning System photogrammetry provide a universal set of coordinates across city, county, or State lines. FEMA requires such a foundation of accurate coordinates for its flood maps.

#### Accomplishments to Date

- ✓ Objective participants have agreed that a formal partnership between FEMA and NGS is in the best interests of both agencies. In addition, FEMA 37, *Guidelines and Specifications for Study Contractors*, is being revised to mandate the use of NGS high-accuracy benchmarks from the National Spatial Reference System in lieu of FEMA's traditional Elevation Reference Marks.

#### Action Plan

The NGS has submitted a draft Memorandum of Understanding (MOU) to FEMA for review.

### 7.3.5 U.S. Fish and Wildlife Service Partnership to Improve Mapping of Coastal Barrier Resources System Areas

#### Summary of Objective

This objective is to establish partnership with and provide technical assistance to the U.S. Fish and Wildlife Service (USF&WS) to improve mapping of Coastal Barrier Resources System (CBRS) areas. Specifically, the objective is to encourage and assist the Service in producing digital, vector mapping suitable for direct incorporation as a thematic layer in digital FIRMs and potential posting on the World Wide Web.

### Accomplishments through FY 1999

- ✓ Several meetings have been held between the agencies to discuss ongoing initiatives and future opportunities that facilitate the partnership objectives.
- ✓ Completion of the Dare County, North Carolina, pilot CBRS mapping project whereby the existing CBRS maps in Dare County were superseded by larger scale, horizontally controlled, digitally produced maps. This marks the first digital 1"=1,000' scale maps produced for CBRS boundaries.

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- ✓ Continued meetings with Congressional delegations to investigate potential funding of a digital CBRS pilot mapping project.
- ✓ Mapped all previously unmapped CBRS units using DOQQs.
- ✓ Participated in a CBRS workshop at the National Flood Conference.
- ✓ Processed changes to CBRS boundaries through the LOMR process. This new procedure significantly reduces the processing time for showing modified CBRS boundaries on FIRMs.
- ✓ Posted World Wide Web CBRS database and established protocols for maintenance and update of these data.

### **FY 2000 Accomplishments**

- ✓ The Dare County CBRS maps were adopted into Public Law (PL 106-116) on November 29, 1999. These maps are the first set of horizontally controlled (georeferenced) digitally produced CBRS source maps formally adopted into public law by an act of Congress.

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- ✓ Extensively improved our outreach and provided a report to Congress entitled “Flood Hazard Mapping of Areas Within the Coastal Barrier Resources System,” dated June 21, 2000. Worked closely with the USF&WS on several problematic CBRS mapping issues and participated in field verification and remapping exercises.
- ✓ Facilitated field work and remapping of CBRS unit NC-07P on Bald Head Island, NC, and funded the creation of new CBRS maps for this unit soon to be enacted into public law.
- ✓ Assisted in the reanalysis and remapping of CBRS unit P31 in Bay County, Florida. Finalization of this initiative is pending further investigation by the USF&WS.
- ✓ Assisted and partially funded the digital remapping of CBRS units NC-01 and P19P / P19. The resulting digital maps have since been passed into public law (PL 106-332 dated 10/19/00 and PL 106-360 dated 10/27/00, respectively).
- ✓ Published several recent changes to the CBRS as LOMRs to expedite the dissemination of changes to CBRS boundaries enacted by congressional legislation. Also established a protocol for initiating Physical Map Revisions to follow CBRS LOMRs to ensure that the FIRMs are updated expeditiously with respect to CBRS boundary changes.
- ✓ Enhanced the FEMA website at [www.fema.gov/nfip/cobra.htm](http://www.fema.gov/nfip/cobra.htm) to include references to revisions made by LOMR.
- ✓ Currently finalizing an interagency agreement with the USF&WS enabling a cost recovery of FEMA efforts in modernizing CBRS mapping.
- ✓ Worked with the USF&WS to craft a map modernization program that seeks to use DOQQs as the primary base map of choice for future CBRS remapping. This option will be used during the congressionally mandated 5-year update of the CBRS that is currently underway.
- ✓ Assisted USF&WS in the development of a plan for the Digital Mapping Pilot Project that was included in the CBRS Reauthorization Act (Public Law 106-544 dated 11/13/00).

### Action Plan

- ✓ Continue to hold meetings on an as-needed basis to address continuation of the objectives in this task.
- ✓ Continue to pursue further digital conversion of CBRS boundaries similar to the Dare County pilot project, as well as the NC-01, P19P, and P19 remapping projects to eventually be adopted by Congress and ultimately to be used for floodplain management purposes.
- ✓ Assemble comprehensive library of all CBRS-related documents to assist and support both agencies in research and development initiatives.

### **7.3.6 Participation in the U.S. Geological Survey National Digital Orthophoto Partnership Program**

#### Summary of Objective

This objective is to establish a partnership with USGS through the National Digital Orthophoto Partnership (NDOP) program. Through the NDOP Program, DOQQs are produced for those communities where no community base map that meets the FEMA base map specifications exists.

### Accomplishments to Date

- ✓ A series of meetings has been held in 1999 with the USGS to discuss partnering options for the acquisition of DOQQs to support FEMA's digital FIRM mapping needs. These meetings will continue.
- ✓ The draft MOU for FEMA participation in the USGS NDOP program was submitted to FEMA for review.

### Action Plan

- ✓ FEMA and the USGS will sign the MOU.
- ✓ FEMA must name representatives for the NDOP steering committee, project coordination subcommittee, and technical subcommittee.

### Deliverables

- ✓ An MOU with the USGS. (If FEMA enters into a cost-share arrangement with the USGS for the production of the DOQQs or other base map products, FEMA will have to execute an Interagency Agreement with the USGS.)
- ✓ Based on a reasonable production schedule identified through the Mapping Needs Assessment Process, the USGS would produce base mapping for new studies and revisions, where acceptable base map data do not exist.

### 7.3.7 Participation in the National Digital Elevation Program

#### Summary of Objective

Accurate elevation data are necessary for a wide range of purposes, such as the design of public works and engineering projects, emergency response planning, resource management, land use analysis and planning, and a wide range of other uses. Within the past decade, advances in technology have made it possible to collect and use digital land elevation data in a cost-effective manner. Consequently, use of digital elevation technology has become common at all levels of government, and advances in the digital elevation collection and manipulation technologies will undoubtedly make its use even more widespread.

With an ever-growing demand for digital elevation data by Federal, State and local governments, the NDEP was established to promote the exchange of digital elevation data and technology between government, private and non-profit sectors and the academic community and establish standards and guidance that will benefit all agencies and users. The primary goals of the NDEP include:

- Enhance data sharing among Federal, State, and local agencies; the private sector; and academia;
- Minimize redundant data production;
- Leverage resources to satisfy multiple requirements;
- Develop flexible standards common to all users; and
- Assure availability of "best available" digital topographic data

#### Accomplishments through FY 1999

- ✓ The NDEP was formed in FY 2001; no activities were conducted prior to FY 2000.

### **FY 2000 Accomplishments**

No formal activities were conducted in FY 2000; however, preliminary planning meetings were held in FY 2000. The NDEP was officially established in FY 2001. Recent FY2001 accomplishments include the following:

- ✓ A Steering Committee and two subcommittees have been established.
- ✓ A Charter outlining the guidelines and operating procedures for the program has been prepared and adopted by ten NDEP members.
- ✓ An effort to identify existing digital elevation data and planned data collection efforts has been initiated.
- ✓ A draft outline has been prepared for guidelines on digital elevation data.

### **Action Plan**

- ✓ Identify existing digital elevation data that can be shared between participating agencies.
- ✓ Establish a process to share all digital elevation data and coordinate data collection efforts.
- ✓ Prepare guidelines for collecting, processing, and archiving digital elevation data.



### Deliverables

- ✓ A summary of existing and planned digital elevation data.
- ✓ Guidelines for collecting, processing, and archiving digital elevation data.

### **7.3.8 Potential New Objectives Identified in Fiscal Year 2001**

#### Summary of Objectives

In assessing the status of the active objectives of the Map Modernization Plan, FEMA determined that the following objectives are considered complete in Fiscal Year 2001:

- Revised Guidelines for Determining Flood Hazards on Alluvial Fans
- NFIRA Coastal Erosion Studies
- Riverine Erosion Hazard Area Feasibility Study
- Recommendations for Using Future Conditions Hydrology for the NFIP
- Base Map Specifications
- Scoping of Flood Insurance Studies
- Optimized Study Process
- Map Modernization Outreach

The following objectives were identified in Fiscal Year 2001 as potential new improvements to flood hazard mapping products and processes or steps needed to fully implement completed objectives:

- CMIX Development and Implementation
  - ✓ The Coordinating Mapping Information Exchange (CMIX) database is being developed to reside at FEMA and consolidate flood hazard mapping information. This information is planned to include budget data for map and letter actions.
- Technical Mapping Advisory Council follow-up
  - ✓ This objective will pursue further coordination with the agencies and organizations involved with the Council and ensure implementation of the Council's recommendations as appropriate.
- Data Archiving Strategy
  - ✓ As FEMA implements digital technologies in flood hazard mapping, a strategy for storage of existing and newly created flood mapping information is needed. Coordination of data submittal, distribution, and storage requirements is essential.

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- Superseded FIRM Policy
  - ✓ As FEMA produces digital FIRMs to supersede existing paper maps, a strategy needs to be defined for maintaining an archive of superseded FIRMs as warranted.
- New Flood Study Report Product
  - ✓ The Flood Insurance Study text format requires updating to incorporate countywide and CTP requirements and digital technologies
- Web Information Management Plan
  - ✓ This objective involves follow-up of the completed web development objective. Continuing coordination regarding Map Modernization web site contents is needed to ensure usability of the web site by all users of FEMA's flood hazard maps.
- Subsidence Policy
  - ✓ Technical issues involving consideration of subsidence in flood hazard mapping for many regions of the nation necessitate formal definition and update to FEMA's subsidence policy.
- Seamless Flood Hazard Mapping
  - ✓ This objective involves development of mapping policies to facilitate basin-wide or statewide floodplain mapping. The flood hazard maps would include information for multiple jurisdictions on the same map to maximize FEMA's efficiencies in map production
- Future Conditions Hydrology Policy Implementation
  - ✓ The completed objective identified policies for evaluating and mapping future conditions. This objective pursues implementation of these mapping technologies in the production of flood hazard maps.
- Scoping Process Implementation
  - ✓ The completed objective identified procedures for scoping flood hazard studies. This objective involves refinement and tailoring of those procedures to facilitate full implementation in all FEMA's flood hazard mapping.
- Optimized Study Process Implementation
  - ✓ Completion of Map Modernization objective 17 resulted in the definition of many procedures for increasing the efficiency of FEMA's flood hazard mapping. The scoping process was fully explored and defined; more effort is needed to implement other optimized study process recommendations, such as changes to statutory Appeals and Compliance periods.

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- Flood Study Rollout/Best Practices Guidance
  - ✓ This objective involves the definition of procedures to be implemented by FEMA headquarters and regional staff in coordinating release of preliminary FIRMs to communities. As follow-up to the increased role of communities in the scoping process, documentation of best practices will aid community involvement in the distribution of preliminary FIRMs and subsequent statutory processing.

FEMA's efforts regarding these new objectives will be defined and developed in FY 2001.